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Subject: A Word of Praise

May 31, 1934.

Dear Reader:

We received a letter recently that contained so much of human interest that I want to share it with you. The letter came from a track foreman on a western road. It read in part as follows:

> "I want to thank you for publishing my discussion on the lining of track in your Questions and Answers department. At the time that I received your letter calling my attention to my article, I had just undergone a serious operation, my fourth one, and was still in the hospital, a very sick man. Sick as I was, however, I was filled with joy when my roadmaster called to see me and told me how proud he was to have a foreman who could write such an article. He told me also that our division engineer had praised the same article."

This letter was brought to my attention because of the very evident inspiration that this man had received from the commendation of his superior officers. When he recovers and returns to work, he will long retain this inspiration, aroused by the thoughtful words of commendation of his roadmaster and division engineer. In like manner, I am sure that you share my feeling that a word of praise worthily bestowed will do much to bring many a foreman (and roadmaster, too) out of the depths of discouragement born of inadequate forces, shortage of materials and resulting rough track today. We need more such thoughtfulness.

Yours sincerely,

Elmer T. Howson

Editor

ETH*JC

Railway Engineering and Maintenance

NAME REGISTERED U. S. PATENT OFFICE

JUNE, 1934

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Railway Engineering and Maintenance

GOVERNMENT OWNERSHIP

Will It Solve the Railway Problem?

IS government ownership of the railways imminent? Will it provide a panacea for the ills and the deficiencies that are being charged against the railways today? How will it affect the service rendered the public? Will it promote or reduce economy of operation? What will be the effect on the employees?

These are questions that are of very direct concern to every employee of the engineering and maintenance of way department and of every other department of the railways, for they not only strike at the very heart of the industry with which he has cast his lot, but they affect the future security of his own position and the conditions under which he will work as well. It is to his own interest, therefore, to acquaint himself with the facts, in order that he may be able not only to determine his own course of action but also to advise and inform those of his associates and neighbors who are less well acquainted with the facts.

Not a Local Issue

Agitation for government ownership of railways is not a recent development. It has been a goal of a certain school of thought for years. Neither is the question local to the United States, for it is being debated far more actively in Canada, and is also a political issue in several European countries.

It is pertinent to the discussion of this subject to note that it is always agitated more actively during periods of business recession, with the implication that any decline in railway earnings and any financial difficulties that result therefrom are peculiar to private ownership and can be cleared up by recourse to public administration. Yet the decline in earnings that has been evidenced on the railways prevails not only in other private business but in governmental agencies as well. Postal earnings have shown the same effect of slackened industrial activity, as have income tax returns, customs receipts and other governmental revenues. Such recessions in earnings are not confined to the railways; rather they are universal in their application.

That the earnings of the railways now are and have been inadequate is admitted. However, the roads are controlled, as to earnings, by the rates which they are allowed to charge, which rates are fixed by the Interstate Commerce Commission. In this capacity, the Commission operated until 1933 under a provision of the Transportation Act of 1920, which instructed it to so fix railway rates as to enable the railways to earn 5¾ per cent on the investment in their properties. This the Commission consistently failed to do, not only in the recent years of depression but in the years of widespread prosperity as well.

It is by reason of this failure, rather than because of any widespread mismanagement, that the railways entered the depression in 1929 without the reserves necessary to carry them through the slump without aid. It is because of this fact, also, that the credit of the railways has been reduced to the point where few of them have been able to meet their needs for additional money by the sale of stock and they have been forced to issue bonds, creating an unbalanced capital structure that has added to their difficulties in recent months.

Demonstration Best Test

It has long been recognized that the merit of any measure is best demonstrated by trial. In government ownership of the railways, ample demonstrations are available. Several can be found in Europe. Italy, for example, has attracted much attention of late by reason of the forceful administration of its dictator, Mussolini, who has emphasized efficiency above all else. It is especially significant, therefore, that he found the railways, long operated by the government, in such a state of inefficiency that he endeavored to locate a private corporation that would agree to take them over and operate them, going so far as to offer to lease them to a responsible party for $1 a year rental.

Likewise, in Canada the government, as a result of over-expansion and resulting insolvency, found itself some years ago in possession of some 22,000 miles of railroads for which it had expended some two billion dollars. From this investment it has not since received a dollar of interest but has, on the contrary, been required to meet deficits ranging from 40 to 75 million dollars annually. Last year, the deficit of this one railway system was greater than the entire receipts of the Dominion from income taxes. In the meantime, the privately owned Canadian Pacific Railway continues to pay its expenses, and the interest on its funded debt and most of the time it has also paid dividends to its stockholders.

Coming to a project of the United States government, the Alaska Railroad, it is only a few years since government officers promised that, if the funds for its con-

struction were forthcoming, it would earn an adequate return on the investment. Yet, in the seven years from 1925 to 1931, this road of less than 500 miles failed to earn its expenses by $7,265,427, or more than a million dollars a year.

United States Made Test in 1918-1920

But why go to Europe, to Canada or even to Alaska? We had a very illuminating experience with government operation of the railways of the United States themselves in 1918-19. Taken over as an emergency measure to help with the war, the government operated the roads for 26 months, without restraint from their owners or other outside agencies. This experience is so recent as still to be fresh in minds of most men in railway service today. In that period, it will be remembered that service deteriorated to such an extent as to lead to widespread criticism—that the properties were so grossly undermaintained as to lead to later reimbursements to their owners totaling hundreds of millions of dollars—and above all, that expenses were so increased as to load onto the taxpayers a deficit totaling some $1,700,000,000. It is no wonder that with such results, the public rejected with almost unanimous acclaim in 1920 the suggestion by the then federal director general of the railroads, that government operation be extended for five years and expressed in no uncertain terms its demands that government operation be brought to an end and the roads returned to their owners. It is not without significance that, after rehabilitating their properties to overcome the neglect of the period of federal control, the railways have given the public an excellence of service never before attained —a service that, through private initiative, is still bringing improvements in comfort and speed, such as air conditioned coaches and high speed trains like that of the Burlington which last Saturday made the fastest long distance run ever made by any railway in its trip from Denver to Chicago in 13 hours, an average speed of 77.5 miles per hour for the 1,015 miles.

Government ownership of railways is not a new theory. Neither is it an untried one. On the contrary, it has been tried—by the people of the United States—and found wanting. It will not promote efficiency. Neither is it financially feasible, especially at a time when our public debt is at an all-time high record and when our current expenditures are exceeding our national income at a greater rate than ever before. To add still further to this debt to the extent of some twenty-six billion dollars necessary for the purchase of the railways is unthinkable for any sane person. It is to the credit of Joseph B. Eastman, federal co-ordinator of railroads and long time advocate of government ownership, that he has concluded that the time for such a huge experiment has not yet arrived.

Rather than government ownership, the solution of our railway problem lies in the willingness of the people to give the railways equality of opportunity with their now-subsidized competitors on the highways, on the waterways and in the air and rates sufficient to enable them to earn the return contemplated in the transportation act. With such encouragement, the public will be provided the maximum of service with the minimum of responsibility and of investment.

THE DROUGHT

A Severe Test of the Adequacy of Water Supplies

A DROUGHT of grave potentialities, following a year of subnormal rainfall, is focusing attention once more on the adequacy, or inadequacy, of railway water supplies, and this after a respite of but a single year (1932) of normal or slightly excessive rainfall following the widespread and ruinous drought of 1930 and 1931. While the present dry spell is not as extensive as the preceding one and has not as yet produced such serious water famines, it is justly the occasion for grave concern, for unless it is soon broken water shortages will cause severe hardship in many localities.

Periods of drought serve as an effective although exceedingly unfortunate check on the adequacy of water supply facilities, but the results of such tests are by no means a reliable measure of the relative competence of those responsible for water supply developments. Water in adequate quantities is much more readily available in some locations than others, and cases of shortage now being brought to light may in many instances involve situations where more adequate supplies can be had only at prohibitive expenditures. The fact remains, however, that lines that have pursued a forehanded policy in improving their water supplies, have suffered less, on the whole, than lines that have been less enterprising in this field. However, just as the drought of 1930 and 1931 disclosed the deficiencies in the water supplies, so the present period of inadequate rainfall will bring out the points where supplies are not dependable. But there is this difference: the current difficulties are occurring during a period of increasing railway earnings which provide an incentive for advocating programs of improvement that was absent during the period of steadily declining revenues of 1930 and 1931.

ANGLE BARS

Good Drainage Minimizes This Trouble

JOINT bars have probably been given more consideration that any other device used in track construction. Yet there is no road today that is not afflicted to some degree with broken bars. Where this situation exists, the cause can usually be found in improper or neglected maintenance. This then puts the problem squarely up to the roadmaster and section forces.

Broken angle bars rarely occur on well-maintained track. If a joint is allowed to become low and remain in this condition for some time, the joint bars are likely to become bent and take a permanent set. When such a joint is then raised, the stresses in the bars are reversed and a minute crack appears at the top of the bar, gradually increasing and extending downward, until it must be removed in the interest of safety. If the all-too-common practice is followed of "cocking" the joints a little, in the expectation that they will eventually settle to a uniform surface with the remainder of the rail, the trouble will be accentuated. This practice should be prohibited.

It has been said that angle bars never break where the joints are constantly maintained to good surface and the bolts are kept tight. The most common cause for low joints is inadequate drainage. Foul ballast starts the ties to churning and a long train of evils, including low joints, ensues. If this is a general condition, it may be beyond the ability of the local forces to correct, but even here great improvement can be made with less total effort than will be required to keep the joints in surface without applying corrective measures. The ballast should be dug down to subgrade at the ends of the joint ties and that in the cribs removed, cleaned and returned to the track, after which the joint should be tamped and the bolts tightened. With the improved drainage thus obtained, the joint will stay in surface unless it has become too badly damaged.

While the most common, and in many ways the most important, cause of broken joint bars is improper drainage, other causes alone or in combination may produce the same result. These include loose bolts, frozen joints, wide expansion gaps, inadequate tie support, creeping rail and other similar items. A check of this list of defects in maintenance indicates, however, that every item mentioned is a responsibility of the section forces. If supervisory officers do not see that they are corrected, it is equally their fault that unfavorable results follow their own failure to insist on proper maintenance.

TRESTLES

Is Greater Refinement Advisable?

THE article reviewing the salient features of the standard open-deck pile trestle plan of the Santa Fe System that appears on page 324 of this issue illustrates the progress that has been made in the practice of framing bridge timbers before treatment. Applied first to the ties and guard timbers, of the wooden decks of steel bridges, this practice has been extended gradually to both ballasted and open deck trestles, although it is only in steel bridge decks that the procedure has been elaborated to the extent that virtually all boring, in addition to sizing and sawing, can be done in the shop.

While the most frequent occasion for variation in the dimensions of a trestle is encountered in the driving of the bents, this need not introduce serious difficulties. Any deviation in the position of individual piles can be readily taken care of in driving the drift bolts through prebored holes in the caps. However, some roads deem this variation of sufficient importance to require an arrangement of stringer chords that eliminates butted joints of stringers on the caps. The Santa Fe, on the other hand, feels that the close packing of chords possesses advantages that warrant the greater refinement in locating bents that is necessary to permit butt joints, and has experienced no difficulty in avoiding the necessity for cutting off stringers in the field on this account.

But regardless of the practice followed with respect to this detail, experience has established the fact that there should be no occasion for the field sizing of caps, stringers, ties or guard timbers. When it comes to the boring of bolt holes, the answer is not so definite. The Santa Fe plan provides for the complete preboring of the caps, and the boring of the outside stringers for the deck anchor bolts and for the chord bolts, the holes for chord bolts in the other stringers being bored in the field, using the outside stringers as templets. Ties are prebored only for track spikes. While the foregoing represents an advance in practice with respect to open-deck pile trestles, it falls far short of complete preboring such as done by some roads on the wooden decks of steel bridges. But it is to be questioned whether the greater refinement in measurements, accuracy in mill work, or elaboration in marking that would be necessary to permit complete preboring is warranted, especially in view of the marked advance made in recent years in the introduction of preservative into field-cut holes. As a matter of fact, refinement in design and refinement in workmanship must go hand in hand; it is better to proceed a step at a time than to initiate such drastic changes as to preclude their ready acceptance by the man in the field.

HIDDEN WASTE

Be Sure You Know All of Your Pipe Lines

MANY railways have carried out intensive campaigns to reduce water waste at shops, terminals and elsewhere. Many water service departments have also made extended investigations to find hidden sources of waste. Despite these efforts, however, instances of waste from unsuspected sources crop out occasionally to confound the officers of this department.

Such a case came to light not long ago at a terminal where it was supposed that every possible hidden source of leakage had been discovered and eliminated. During the long period of heavy business and of shop activity, the draft on the storage tank from which water was drawn for the shops, enginehouse and other uses, as well as for locomotives, was substantially continuous. However, when the shops were reduced to one shift and other activities similarly restricted, it was noticed that when the supply pumps were shut down, there was a constant lowering of the storage water, even when it was known that no water was being used legitimately.

After a long search, a two-inch pipe was discovered discharging a full stream, apparently under considerable head. This outlet was in a cinder fill, along the foot of which there was a small drainage ditch, accounting for the fact that the leak had not been discovered earlier. This pipe apparently had served a facility that had been abandoned many years before, at which time a cap had been placed on the dead end. Lying in the cinder fill, this pipe had rusted through until eventually it was discharging at full capacity.

This incident, which is only one of a number that could be cited, emphasizes two things: (1) Every pipe line, whether it be a main or a relatively unimportant service connection, should be a matter of record and should be platted on a map that is prepared specifically to indicate the location, size and purpose of all underground pipe lines; (2) when the use of a pipe line is discontinued, it should be disconnected.

Rail End Welding

1. Preliminary Examination of the Rail Ends at a Joint with a Steel Straight Edge.

2. Heating the Rail Ends Preliminary to the Application of Weld Metal.

3. Applying the Metal in the Building Up Process.

4. Peening the Weld Material During Its Application.

On the Chesapeake & Ohio, as on other large railroads, the practice of building up battered rail ends by the oxy-acetylene process is now ranked among the important activities of the maintenance department. Another phase of this work which is also receiving increased attention is the heat-treating of rail ends on both built-up and new rail. The accompanying article tells how the C. & O., through constant improvement in organization and technic, has substantially reduced the cost of its rail welding and heat-treating operations in the face of a higher standard of workmanship.

THE Chesapeake & Ohio is one of the most active roads in building up battered rail ends by the oxy-acetylene process and is reaping, to a corresponding degree, the advantages and economies derived from this class of work. In recent years, rail end repair has been a major item of maintenance of way work on this road, and one of the few items of such work considered so essential to good track conditions and economy in maintenance that it has not been reduced appreciably in the face of the necessity for reducing maintenance expenditures generally. In 1929, 129,881 joints were built up; in 1930, 151,430 joints; in 1931, 147,639 joints; and in 1932, 130,251 joints were repaired, while the program for 1933 called for the reconditioning of approximately 168,000 joints. Furthermore, the railroad is now heat-treating all built-up rail ends to increase the hardness of the weld metal added; and has also adopted the practice of heat-treating the ends of all new rails laid, before traffic is run over them.

There is little radically new about the welding practice on the Chesapeake & Ohio, and nothing spectacular in the method of carrying it out, but it is interesting to note that through constant improvement in organization and technic, the work is now being done, including heat treatment of the welds, at an average cost per joint of about ten per cent less than the cost of the welding alone in 1928 and 1929.

Work Programed and Carefully Supervised

The earliest experiments in the building up of battered rail ends on the Chesapeake & Ohio were carried out in 1923 under the direct supervision of the supervisor of reclamation, who is in charge of the road's reclamation plant at Barboursville, W. Va. These experiments soon developed into large-scale practice, and by 1929, more than 129,000 joints annually were being built up over the system

Reaches High Peak

on Chesapeake & Ohio

by division gangs, organized and developed largely out of the original force of welders. This expansion has continued until at the present time there are forces on each division of the road, which include a total of approximately 55 welders.

Because of this growth of rail end welding, the work has now been put on a strictly division basis, wherein the welding forces are under the direct supervision of and report to the various division engineers. All recommendations for rail joint welding to be included in a year's program are made by the division engineers, who, in company with their track supervisors make a personal inspection of the tracks late in the fall specifically for this purpose. These recommendations are sent to the engineer maintenance of way, where they are analyzed and summarized into a system program. If any questions arise relative to the work recommended, a field check is made by a system representative.

Final development of the individual programs of the divisions is not undertaken until early spring, following approval of the maintenance of way budget and authorization of the amount of rail end work to be done. At that time, after a more detailed inspection of the joint conditions on the divisions, detailed programs are prepared which definitely schedule the order in which the various sections of the work will be undertaken.

The order of the work is influenced to a large extent by the amount of batter at the joints, but, at the same time, an attempt is made to co-ordinate it with surfacing work to insure good track surface conditions at the time the welding is done. Where possible, the welding forces follow closely behind surfacing gangs, but where this is impractical, the track forces at least go over the territory to be welded immediately prior to the work and see that any low joints are picked up. In both the general surfacing and the joint pick-up work, all loose bolts are tightened and, where required to bring about good joint conditions, new or reconditioned joint bars are applied.

All Joints Given Some Attention

In carrying out the rail and repair work, attention of some kind is usually given to all joints, even though the rail at only 50 to 60 per cent of them may have become battered as much as 3/64 in., which is considered the amount beyond which attention is justified. The purpose of this is to leave the track in uniformly good condition after it has been gone over, and thereby preclude the necessity for giving it further attention for a period of years, except for the possible necessity for touching up a few joints which may give way prematurely.

This out-of-face attention does not mean neces-

5. Shaping and Smoothing the Built-Up Rail Head While the Rail End and Weld Metal Are Still Very Hot.

6. Reheating the Weld and Rail End at the Very End of the Rail Prior to Opening the Joint and Beveling.

7. Opening the Joint and Beveling the Rail End with a Track Chisel.

8. Final Smoothing Up of the Rebuilt Head, Using a Flatter.

(See Next Page)

9. Checking the Surface of the Repaired Weld with a Straight Edge.

10. Reheating the Rail End in the Heat Treating Process.

11. Quenching the Heated Rail End in the Heat Treating Process.

12. Drawing Back the Metal in the Rail End After Quenching in Order to Produce the Proper Hardness.

sarily the addition of weld metal at all joints, because the Chesapeake & Ohio has adopted the practice of heating and reforming rail ends which require some attention but which do not warrant or require the application of additional metal. In most of these cases, the rail head metal is still in the head but has flowed out of place under the pounding action of the wheels. Thus, it is largely a matter of reshaping the head to put this metal back into place. This is the function of the reforming, which is done by heating the rail ends to a forging temperature and then, with a flatter and hand sledge, driving the flowed metal back into position and reshaping the wearing surface. Even when weld metal must be added, advantage is taken of reshaping the head as much as possible to make use of the sound base metal, merely out of place. This minimizes the amount of weld metal required and reduces the time necessary to make the joint repairs.

Another feature of the work on the Chesapeake & Ohio which calls for some attention to all joints in territories being worked over, is the fact that since about the middle of 1932 it has been the practice to heat-treat all reconditioned rail ends, whether built up by welding or merely reformed. This practice increases the hardness of the rail ends and the added weld metal and increases materially the resistance of the reconditioned ends to batter. This same practice of heat treatment is now being applied to new rail as laid, having been adopted in 1932 after a sizeable service test had demonstrated it to be highly beneficial and economical.

Details of Reforming Rail Ends

As a welder moves from joint to joint, his first operation is to determine the amount of batter in the rail ends, both as regards depth and length, by means of an 18-in. straight edge. Thus informed, he marks or makes a mental note of the limits of batter, and then starts such reconditioning as may be required. Where reforming alone is deemed sufficient the process is about as follows:

The operator first heats the center of the rail head to a forging heat within the limits of the batter. He then places a flatter against the side of the head, while a helper strikes it as it is moved back and forth along the heated area. This operation is done on both sides of the ball as required, and causes the surface of the rail within the heated area to rise. Heat is then applied to the sides of the rail head by passing the torch over the head in more or less the shape of the letter "U", with the open end of the U toward the end of the rail. The flatter is then brought into action again, and this time drives inward any flowed metal and raises the surface of the rail head from the center toward the sides. If the batter is not too deep, the completion of this operation will bring the rail head up to, or practically up to the desired surface, except possibly at the end where the batter is invariably the greatest.

To raise the level at the end, the end area for a distance of about an inch is brought to a forging heat, and then a hot-cut chisel of the proper thickness and width is driven between the rail ends. This not only raises the surface of the rail end being worked on, but also produces the desired bevel on the end of the rail. A similar procedure is followed in reforming the abuting rail end, and

then, if the straight edge does not show it uniformly level across the joint, both ends are reheated and are brought to the same height by working the flatter across the joint. Immediately upon the completion of the reconditioning, while the rail ends are still hot, the straight edge should swing freely from the junction of the two rails. This insures that with cooling and contraction the reconditioned joint will not be too low. If the desired restoration of surface is acquired without the addition of weld metal, the rail ends are heat treated immediately, taking advantage of the heat already in the ends, and thereby saving in both the labor and gases consumed over applying the heat treatment as a distinctly separate operation.

Special Flatter Used

If examination of a joint indicates that weld metal must be added, either because it is too low or because of a chipped condition, the first step in reconditioning is much the same as though reforming alone was required. Following reshaping, any chipped or loose metal is burned out to get down to solid base metal, and then the weld metal is applied. During this latter operation the weld metal is forged repeatedly with a hand hammer until the depression has been completely filled. In the early days of rail welding on the Chesapeake & Ohio, forging of the weld metal as applied was discouraged, but it has since been found that forging materially improves the characteristics of the metal.

When brought to surface, the weld is smoothed up and the head is shaped as necessary, using a flatter which is struck by an eight-pound maul in the hands of a helper. The flatter used in this operation, as well as that employed in the reforming work, is oblong in shape, 3¾ in. long and 2 in. wide, this having been found through experience to be much more satisfactory than smaller flatters or those with a square face.

With the rail end up to surface, it is again reheated, and a chisel is then driven into the joint to produce the desired gap and the bevel at the end of the rail head. If this causes a slight bulging of the metal, as is frequently the case, the head is again resmoothed with the flatter to form a perfectly uniform surface. Where the batter on each rail extends over more than about four inches, or where there is a distinct opening between rail ends, each rail end is worked separately. On the other hand, where the length of batter is limited, and especially where the rail ends are in contact, both rail ends are repaired at the same time.

No surface grinding is done on the welds, it being the belief that with experience and skill a satisfactorily smooth surface can be secured with the flatter alone. The only grinding being done, which was started in 1933 with the purchase of several machines, is in connection with the slotting and beveling of the rail ends. The machines now being used in this work are considered to produce a result much superior to that possible with a chisel.

All Welds Are Heat Treated

Just as soon as the work of reconditioning a joint has been completed, and while the rail and weld metal still retain much of the welding heat, the heat-treating process is applied. In this, both rail

13. Testing the Heat Treating Heat of a Completed Weld with a Pyrometer.

14. Testing Drawback Heat of Completed Weld with a Bar of 50-50 Solder.

15. Stamping Identification Numerals on the Weld.

16. Testing a Weld for Hardness with a Brinnelling Microscope.

ends are first brought to a temperature of approximately 1500 deg. F. and are then quenched with water from a can having perforations in the bottom. Just as soon as the water ceases to bubble on the rail, the quenching operation is *stopped* and a drawing process is applied. In this, the rail ends are reheated to between 600 and 650 deg. F. by passing the torch over them, and then they are allowed to cool naturally to atmospheric temperature to complete the treatment.

The quenching and drawing temperatures employed in the heat treating process are the result of study and tests on the Chesapeake & Ohio and other roads, and are those now generally accepted as accurate for the treatment of open-hearth carbon steel rails. To a large extent the determination of the temperatures in the rail is left to the judgment of the welders, who, it has been found, have become quite consistently accurate. However, as a check on their judgment, to insure that the quenching heat will be uniformly about 1500 deg. at all joints, frequent heat checks are made by the welding foreman with a contact pyrometer. This is applied immediately after the welder withdraws his torch, indicating that in his judgment the proper heat has been attained. The tests have so frequently substantiated the judgment of the experienced welders that there is a tendency to make the tests less frequently with these men, but the practice is still continued as helpful in assisting the men to keep their eyes properly calibrated.

Accurate determination of the drawing heat through visible indications of the heated metal itself is considerably more difficult than determination of the higher quenching heat, but even this is done quite reliably by the experienced welders. As a check from time to time, a solder test is made, which consists of drawing a stick of half-and-half solder over the heated rail. At temperatures less than approximately 600 deg., the silver streak traced on the rail retains its silver appearance, while at temperatures between approximately 600 and 650 deg., the drawing heat desired, the silver streak turns quickly to a golden brown; the more quickly the higher the temperature. If the test, easily applied by the welder while operating the torch, indicates less than the desired amount of heat in the rail, the heating operation is continued until the brownish solder streak is secured.

Repeated tests of the heat treated rail ends on the Chesapeake & Ohio, using a Brinnelling microscope, indicate that a Brinnell of from 340 to 350 is attained quite uniformly, whereas the hardness of normal rail, even following a long period of the cold rolling action of car and locomotive wheels, is only from 260 to 265, and that of the average weld, untreated, is only from about 300 to 325. Through care in the heat-treating process, especially in the raising of the temperature of the rail to the quenching heat and in the more gradual application of the drawing heat, the 340 to 350 Brinnell is obtained in the rail with an increase in the toughness of the metal and without any material increase in its brittleness.

Large Gangs Have Camp Car Outfits

For the most part the work on the Chesapeake & Ohio is done by consolidated division gangs including from three to six welders, although on two divisions, because of special conditions, the welders, each with a helper, work independently. Even on those divisions with the larger consolidated forces, it is not uncommon for one or two welders to be working at widely separated points, building up scattered unwelded joints which may require attention, or touching up any reconditioned joints which may have failed prematurely.

In practically all of the work each welder is assigned a helper, who not only actually assists in the reconditioning of the rail ends, but who also keeps the welder supplied with materials and acts as a watchman. While this is a generous allowance of helper service, it is felt that it is advisable and economical both in facilitating the work and in minimizing the hazard presented by carrying it out under traffic.

On the Huntington Division

Typical of the larger welding gangs is that on the Huntington division, which has a total force of 15 men, including 6 welders, 6 helpers, a welder foreman, a foreman helper and a cook. As implied by the presence of a cook in the force, each of the larger gangs is equipped with a camp car outfit, which is moved from point to point on the division as required. The outfit on the Huntington division includes two standard bunk cars, a combination kitchen and dining car, an office and commissary car, an oxygen supply car, an acetylene supply car, a tool and gasoline car, and a 9,000-gal. engine tender for the quenching water supply. This train is moved from point to point as the general location of the work is changed, but while at any one point the men and materials are moved back and forth between the train and their work on motor cars and trailers. The Huntington division force is fitted with a Mudge light inspection car, a Sheffield 40 heavy-duty motor car, a passenger-carrying trailer seating eight to ten men, and three trailers for transporting equipment and materials, of sufficient size to handle in one load a full day's supply of gas cylinders and quenching water.

As the gang moves out in the morning it takes with it its material requirements for the day, in spite of the fact that the men themselves return to the camp for lunch at noon. On the job, sufficient gas cylinders and water for the needs of two welders are placed at intervals of 500 ft. The welders work in pairs, toward each other, each beginning about 250 ft. from the central material supply. When their work meets, the water barrel or barrels and any unused gas cylinders are moved to a new 500-ft. section ahead of the advance welders. This arrangement minimizes the number of times it becomes necessary to move the cylinders and water supply, with considerable saving in time, and yet keeps the gang as a whole relatively compact and subject to close supervision.

Each night the empty water barrels and any empty gas cylinders are returned to the camp train. Full or partially full gas cylinders are left on the right-of-way alongside the work.

The smaller division gangs, with only three or four welders, are also fitted with camp car quarters, but they do not have the services of a cook. Ordinarily too, the camp train includes only one bunk car and one supply car. The one and two-welder outfits move their equipment and supplies about on light motor cars and trailers and work out of permanent headquarters.

In all cases, regardless of the size of the gangs, the methods employed in reconditioning rail ends are in accordance with the standard practices adopted for the road as a whole. This is assured by system representatives who visit the various gangs periodically and check both the methods employed and the results being secured.

As might be expected with varying degrees of rail end batter and traffic density on different sections of the road, the output of the different gangs, and even of

individual gangs, varies quite widely from time to time. Under certain conditions, from 30 to 40 joints, all requiring the addition of some weld metal, will be reconditioned and heat treated per man per day, while under more severe conditions of joint batter and traffic, as few as 20 to 25 joints may be repaired per man in an eight-hour day. While quantity output is considered desirable in order to minimize costs, quality work is considered of much greater importance and is, therefore, given much more attention on the part of the foreman and all supervisory officers.

Each welder is held responsible for the quality of his work and, for this purpose, is indelibly linked with his work at each joint by means of an assigned numeral which he must stamp on the outside of the rail head. The numeral is followed by two other numerals indicating the month and year in which the work is done. Thus, each built-up joint on the road bears some such identification as 4-6-33. If joints are being conditioned a second time, a second set of designating numbers is stamped apart from the first set. Each joint, therefore, contains a record from which, at any time, the date of repair and the name or names of the welders are readily apparent.

With the increased experience which has been gained on the Chesapeake & Ohio with the continuation of its rail end work, it is a matter of definite record that the quality of the work, as measured in increased life of repaired rail ends, has greatly improved, and, furthermore, that the cost of doing the work has been reduced materially. Prior to the application of heat treatment to the reconditioned ends, it was established definitely that the service life of rails was being extended from about three to seven or eight years, depending upon the volume of traffic handled over them and the general standard to which the track was maintained. Just how much further the life of the rails will be extended by the heat treatment now afforded the rebuilt ends is still a matter for conjecture, but experience to date on both new and repaired rails indicates that more than sufficient increase in life and better joint conditions will result to justify the small added cost involved.

Since 1927, more than 800,000 joints have been built up or rebuilt on the Chesapeake & Ohio. During the last year, the program called for the repair of approximately 168,000 joints, all with the added refinement of heat treatment.

The cost of carrying out the rail end work has varied quite widely with the condition of the rail ends at the time of repair, which is reflected both in the monthly and semi-monthly reports of the different gangs and in the similar reports of individual welders. The outstanding feature in this regard is, however, that the average cost per joint has been reduced consistently.

While the reduced costs have been affected favorably by the fact that, getting caught up with the worst of the rail end welding requirement, the average welds made have not been as long or deep, they also reflect unmistakably the increased skill and efficiency of the welding forces.

From reports of the welding work done thus far during the present year, it is expected that the average cost of reconditioning joints, including heat treatment, will be even less than it was in 1932. While time studies have not been made to determine the added cost of heat treating the welds, it is estimated that this amounts to approximately 10 per cent of the total cost of reconditioning the joints.

The rail end work on the Chesapeake & Ohio is carried out entirely with company forces and company owned welding equipment, using gases furnished by the Air Reduction Sales Company. From its inception on the C. & O. in 1923, until recently, the rail end work on the entire road has been under the immediate supervision of Walter Constance, supervisor of reclamation, who, together with the maintenance officers of the road, has had the constant benefit of the wide experience of the Air Reduction Company's representatives in this class of work. Beginning last year, because of the increased scope and extent of the work, the welding on each division was put in direct charge of the division engineer. From the middle of 1929 until his death, on March 29, 1934, all the work and the methods employed were carried out under the general direction of J. E. King, engineer maintenance of way.

Drought Menaces Water Supplies

WITH a deficiency in rainfall in the north Mississippi Valley west of Lake Michigan ranging from four to more than seven inches since the first of January, diminishing water supplies have become a matter of real hardship in many localities and are a source of serious concern throughout a large part of the entire area. The situation is especially acute because the deficiency in rainfall in many areas is greater than any previous record for the spring months, and follows a year of definitely inadequate precipitation. In other words, the present year started with accumulated deficiencies for 1933 amounting to 4.74 in. in Iowa, 4.93 in South Dakota and 4.31 in. in Minnesota, while in Illinois and Wisconsin, where there was a marked decline in rainfall during the last-half of 1933, the deficiencies for the second six months were 3.17 in. and 3.63 in., respectively.

From the standpoint of the railways, the most serious trouble has developed in western Minnesota, and extending through the Dakotas into Montana. Water is being hauled to important stations on one line, while on another, passenger locomotives have been equipped with a second tender and freight locomotives are hauling three tank cars behind the tender. Thus far, these expedients are confined largely to one railway, but other roads have been compelled to curtail the use of water at a number of stations and report that any appreciable continuation of the drought will exhaust their supplies at many stations.

The shortage of water is experienced primarily where surface supplies are used, such as reservoirs, small streams and shallow wells in which the supply is derived from ground water. While the situation in this regard is most acute in Minnesota and the Dakotas, two roads report trouble in northern Missouri and another in southern Iowa. Reservoir supplies are still adequate in the case of the larger facilities capable of storing considerably more than a year's demand. The most severe conditions have been encountered where dependence has been placed on a larger number of small reservoirs.

The current situation has been complicated by the need for safeguarding municipal needs, where the supply is used jointly by the city and the railroad, or where the road buys water from a municipal plant. At a number of places, it has been necessary for the railway to reduce its draft on such supplies in order to safeguard the domestic requirements. One railway, also, has been asked to prepare plans for the hauling of water a distance of some 50 miles in South Dakota to fulfill the domestic needs of one town from the more adequate supply of another.

Open-Deck Pile Trestle, Built According to Plans Recently Superseded by New Standard

Pile Trestles

Santa Fe Revises Designs To Meet Today's Conditions

After several years' experience in the use of creosoted piles and timbers in open deck trestles during which a careful study was made of the practical considerations imposed in the practice of preframing, the Atchison, Topeka & Santa Fe has adopted new system standard plans for these structures which embody a number of innovations.

ALTHOUGH treated wood has been used in the construction of ballasted-deck trestles for many years, its general application to open-deck structures is of comparatively recent inception. Thus, the Atchison, Topeka & Santa Fe System, which was among the first roads to employ creosoted piles and timbers in ballasted-deck structures, and began the use of treated wood in the bents of open-deck structures in 1904, did not apply treated stringers to the latter until 1926. This change in policy, coming at a time when attention was being directed to the advantage of framing wood before treatment, gave rise to studies of standard plans for open-deck trestles with a view to determining what modifications could be made that would facilitate this practice without unduly complicating either the field or mill work. As a result, complete new standard plans have been developed that are not only designed to reduce the field cutting of the timbers to the minimum consistent with practical considerations imposed, but which also embody improvements in the details of open-deck trestles.

Use Six-Pile Bents

The new plan retains the old standard spacing of 14 ft. center to center of bents, but except for the use of 4-pile bents in special cases on minor branch lines, the new plan provides 6 piles per single-track bent and 11 piles per double-track bent, whereas the old standard specified 4, 5 and 6-pile bents, depending on the height of the bents. This rule applies also to the dump bents, experience having indicated that the added stiffness provided by the extra pile or piles in resisting lateral earth pressure induced under the surcharge of heavy loads warrants its use there as much as in the intermediate bents. Furthermore, in cases where the ground line in front of the dump bent is more than 6 ft. below base of rail, the dump bent is braced by longitudinal 6-in. by 10-in. struts to the adjacent intermediate bents.

A change has been made also in the caps. Whereas, the old plan specified 12-in. by 14-in. caps for trestles on all classes of lines, the new plan calls for 14-in. by 16-in. caps in all cases, except where the live load permits the use of no more than three-ply stringer chords, in which case 12-in. by 14-in. caps are used. The large caps are sized 15½ in. in the vertical dimension and the small caps to 13½ in. The caps are prebored both for the drift bolts into the piles and for sway brace and stringer connection bolts.

The sway bracing of bents involves the conventional use of 3-in. by 10-in. planks, while 6-in. by 10-in. sticks are specified for the diagonal members as well as for the girts of longitudinal bracing where this is required. These diagonal members are given bevel cuts on the ends to permit them to be framed against the caps or against the piles and brace blocks.

New Method of Securing Stringers

The adoption of the new standard plan involved a change from 7-in. by 16-in. stringers (sized to a depth of 15½ in.) to 7-in. by 17-in. stringers sized to 6¾ in. by 16½ in. It was found necessary to size the stringers on the sides because in the new plan they are packed tight instead of being spaced 1 in. apart as in the old plan to provide the necessary ventilation for untreated timber. The plan provides also for the use of stringers two panels long with joints alternating. This arrangement

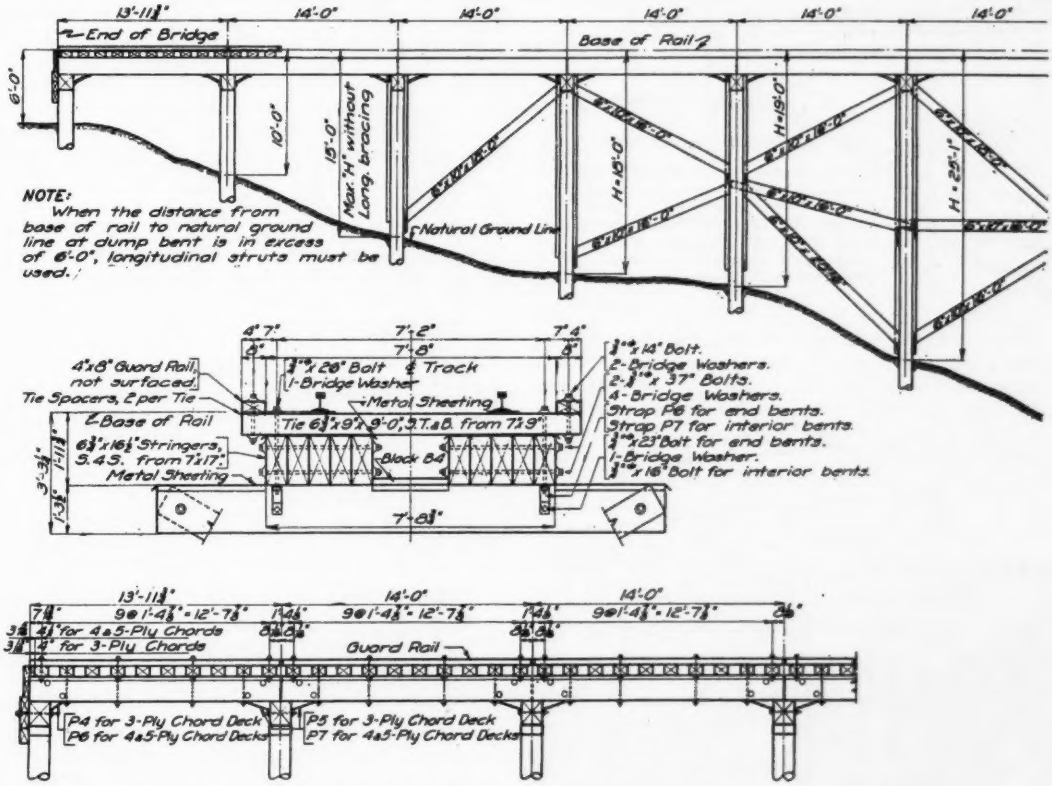
requires butt joints and the cutting of the stringers to exact lengths, namely, 27 ft.-11½ in., for full length stringers and 13 ft.-11½ in. for half the stringers at each end of the trestle to provide for the staggering of joints. The chords are secured against longitudinal movement by means of steel straps made of 3-in. by ⅜-in. bars, bent in the form of a knee brace, one end being bolted to the side of the cap and the other end to the bottom of the outside stringer of each chord. The chords are secured against transverse movement by means of a piece of 3-in. by 10-in. plank, cut to length in the field to fit between the inside faces of the two chords and nailed to the top of the cap with six 5/16-in. by 7-in. wire spikes which are driven through ¼-in. prebored holes.

Only the outside stringer of each chord is prebored. Four vertical holes are provided in each chord (8 per panel) for the deck anchor bolts, two of the bolts serving also for the attachment of the strap chord anchors. In addition, four horizontal holes are provided in each panel for the chord bolts, the holes in the inside stringers being bored in the field, using the outside stringers as

The timber guard rails are 4 in. by 8 in., except on bridges with rail weighing less than 70 lb., where 3-in. by 8-in. guard timbers are used. These timbers are all one panel long (13 ft. 11½ in.) and bolted to the ties at each end and to two intermediate ties, through holes bored in the field. The new plan provides for the use of Bulldog tie spacers between the ties and the guard timbers, these having been employed on the Santa Fe for the last eight years.

Special Details

In locations where there is a possibility that the deck may become submerged during extreme high water, the plan specifies that the deck shall be anchored to each bent by means of two steel straps, 3 in. by ⅜ in., in section with a bolt hole in each end. These straps are fastened to the cap at their upper ends by the bolts that secure the chord anchors to the cap and are attached at their lower ends to the nearest piles. If the bent has sway bracing, the attachment is made with the sway brace bolts; otherwise a special bolt is used for this purpose.



General Elevation of the Open-Deck Trestle, Section Through the Five-Ply Chord, and Elevation of the Deck

templets. The plans provide for chords of three, four and five stringers each, for three classifications of live load.

Another change provided for in the new standard plan is the use of 6¾-in. by 9-in. by 9-ft. ties on bridges provided with four-ply and five-ply chords, confining the use of 5¾-in. by 8-in. ties to trestles with three-ply chords, whereas the eight-inch ties were formerly provided on all trestles. The ties are prebored for track spikes only, holes for the deck anchor bolts being bored in the field to match the prebored holes in the stringers, after the rails have been spiked down and the track has been lined.

The plan provides also that single-track trestles carrying curved track shall have the piles cut off on the correct bevel, so that the full super-elevation can be provided in the caps. The ties are not beveled. Double length stringers, interlaced in the chords, are used as in trestles on tangent track, and as this necessitates a separation of the stringers, spreaders of treated timber are provided where the chord bolts pass through the stringers. Provision is made for the use of seven, instead of six, piles per bent, in accordance with the table on the following page of limiting heights (H) from base of rail to ground line.

The plan provides also that all bents in which H is

more than 10 ft. shall be provided with a 3-in. by 10-in. horizontal brace, bolted to the four outer piles of a six-pile bent and the five outer piles of a seven-pile bent about one foot below the cap. This brace provides a more effective distribution of the centrifugal force to the various piles.

Refinements in Construction Practice

The exposed top surfaces of the caps and the entire top surfaces of stringers are covered with No. 26 gage copper-bearing iron or copper-bearing steel, galvanized with from 7/8 oz. to 1 oz. of prime quality spelter per sq. ft. of surface. Other measures to secure maximum life of the structures are described in the notes given below which appear on the plans.

should be discouraged at all times.

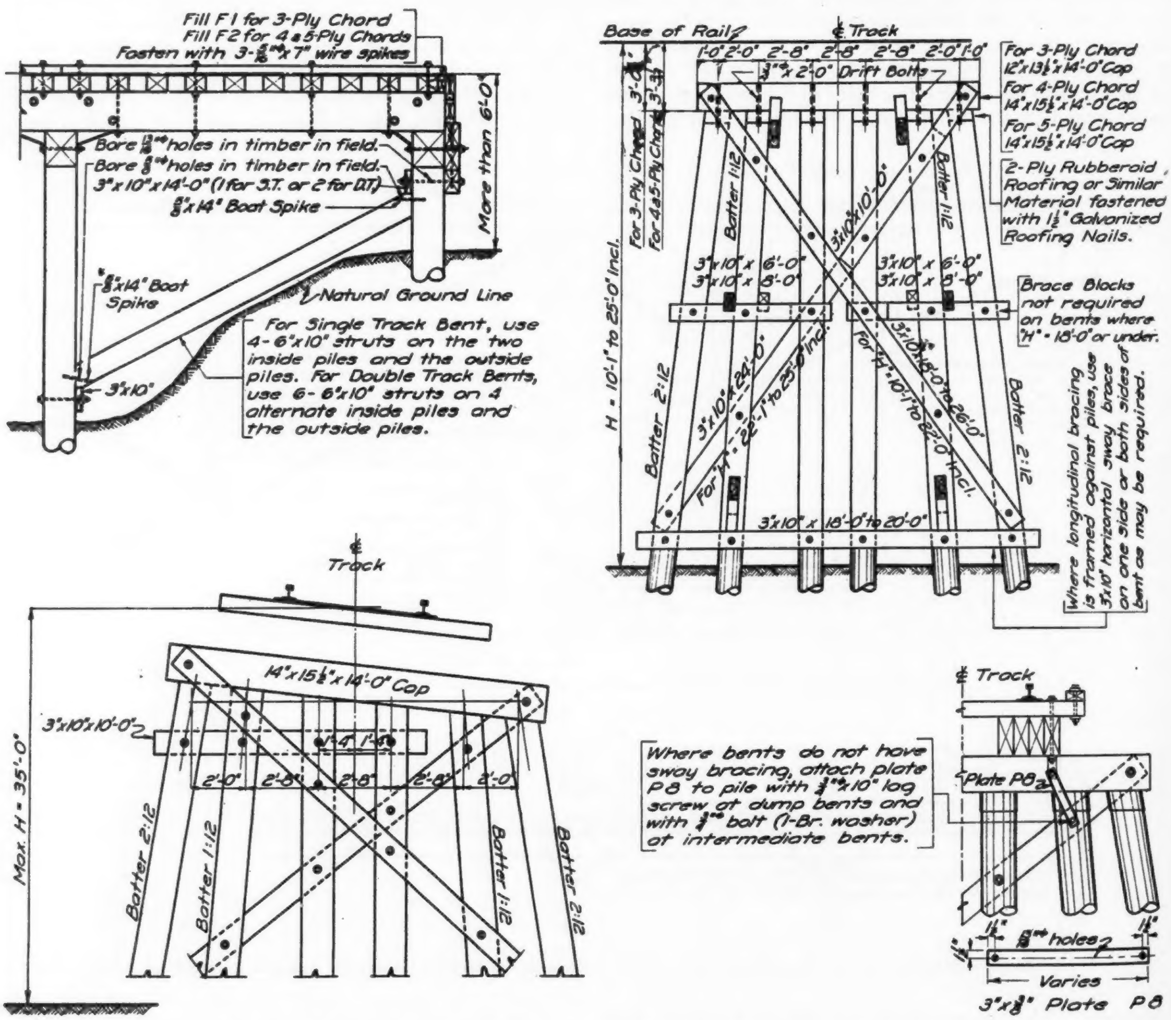
5. When it becomes necessary to work from scaffolding in constructing the bridge, such scaffolding should be hung by ropes and not nailed to the treated timber or piles.

6. When necessary to disturb the surfaces of treated timber

Limiting Heights for Six and Seven-Pile Bents

Degree of Curve	Maximum Permissible Distance (H) from Base of Rail to Ground: Six-Pile Bents	Seven-Pile Bents
30 min.	35 ft.	40 ft.
1 deg.	25 ft.	40 ft.
2 deg.	20 ft.	35 ft.
3 to 8 deg.	16 ft.	20 ft.

or piles, or when the surface has been damaged through handling, such surfaces must be mopped with a liberal quantity of hot preservative, followed by two applications of hot sealing compound.



Method Strutting Dump Bents, Single-Track Bent for Heights of 10 to 25 ft., Single-Track Bent on Curves, and Detail of Special Anchor

1. All timber and piles shall have a preservative treatment.

2. Before treatment is applied, all timber shall be cut to exact lengths, surfaced, and prebored as required.

3. To justify the construction of timber bridges, a long life must be obtained, and maintenance costs must be slight; consequently, extreme care should be exercised in the handling and placing of treated timber and piles.

4. Damaging of the surface of treated timber or piles by the unnecessary use of timber hooks, peevies, etc., should be avoided. When possible, treated timber or piles should be handled by rope slings. The dropping of treated timber or piles from any height

7. When necessary to bore holes in treated timber or piles in the field, pressure treat or swab the entire hole with hot preservative, followed by sealing compound applied hot, and immediately drive the bolt in place. All bolts shall be cleaned of all rust and scale, and dipped in hot sealing compound before being driven. All unused holes, either prebored or bored in the field, shall be fitted at each end with 13/16-in. by 4-in. treated wooden plugs. These plugs shall be dipped in hot sealing compound before being driven.

8. The tops of piles shall be treated with hot preservative, followed by two coats of hot sealing compound, and then cov-

ered with a sheet of approved two-ply Ruberoid roofing or similar material.

9. Just before the completion of the work, all bolts shall be gone over and tightened; the projection of thread shall be cut to ¾ in. and the threads on all bolts shall be burred. All nuts, heads of bolts, and tops of washers shall be painted with two coats of approved bridge paint just before completion of the work. The straps connecting stringers to caps shall be given two coats of approved bridge paint before being placed in position and shall be given a third coat just before the completion of the work.

The trestles designs are based on stress analyses in which impact was assumed at 60 per cent of the live load and the allowable unit stress in the extreme fiber of the timber (in bending) at 2,300 lb. per sq. in. (with impact included). The standard plans were developed under the direction of R. A. Van Ness, bridge engineer, Atchison, Topeka & Santa Fe System.

Test Demonstrates Economy of Spray Painting

THAT the application of paint by the spray method is preferable in bridge work to the hand brush method is demonstrated by a painting test conducted recently by an eastern railroad, the results of which were included in the report of a sub-committee of the Committee on Maintenance of Way Work Equipment of the American Railway Engineering Association, which was presented at the March, 1934, convention at Chicago. While the test was conducted primarily for the purpose of ascertaining the comparative qualities of certain bridge paints, much of the data collected was of value in determining the relative advantages of application by the hand-brush and spray methods. Only the data having a bearing on the last mentioned phase of the test are covered in the report, an abstract of which follows.

The test was made on a deck plate-girder bridge, using six different bridge paints and six primers. In order to conduct the test with equal fairness to all paints used, they were all applied to the same side of the bridge, but on different spans, and were all subject as nearly as possible to the same general conditions.

The first part of the test was made with paint spraying equipment, the same make of spray gun being used exclusively, while in the second part the paint was applied with hand brushes. The spray application was made on the north side of the bridge, beginning at the west end and working east. The brush application was also made on the north side, but east of the spray application. In both cases one gallon of each manufacturer's primer was applied, after which one gallon of each manufacturer's "black" was applied over its own primer.

As an aid in comparing the two methods of application, the following table was compiled, which consists of averages of the various observations made for all the paints that were tested.

	Primers		Paints	
	Spray	Brush	Spray	Brush
Weight per gallon—lb.	14.5	14.5	8.8	8.8
Cost per gallon	$ 1.79	$ 1.79	$ 1.31	$ 1.31
Area covered—sq. ft. per gal.	398.17	385.03	230.01	436.17
Man-hrs. per gal.	.185	1.483	.193	2.165
Man-hrs. per 100 sq. ft.	.052	.396	.091	.508
Cost per 100 sq. ft.	$ .453	$ .722	$ .724	$ .625
Air pressure, lb. per sq. in.	23	....	26	....
Atmospheric temperature	26 deg.	37 deg.	23 deg.	33 deg.

From the foregoing tabulation, figures were obtained which reduce the comparison to more specific terms by giving the values for the spray method in terms of their increase or decrease as compared with the hand brush method. These figures are given in the tabulation that appears below.

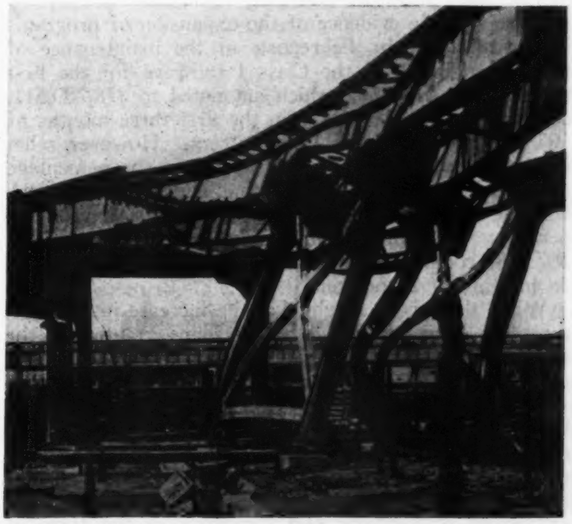
In the case of the primers, it will be noted that there is no question as to the economy of the spray method. In the case of the paints, however, the result appears to be somewhat different. Although the time required for application by the spray method is 82 per cent to 91 per cent less than by the brush method, the total cost of application per 100 sq. ft., including labor and material, is 16 per cent greater. This is accounted for by the fact that the area per gallon covered by brush application is 42 per cent greater than that covered with the spray, and therefore the amount of paint applied per 100 sq. ft. is 42 per cent less.

Comparison of Spray and Brush Methods

	Primers		Paints	
	Amount	Per Cent	Amount	Per Cent
Difference in area covered — sq. ft. per gal.	131.4 inc.	34.2 inc.	206.16 dec.	42.2 dec.
Difference in man-hrs. per gal.	1.298 dec.	87.6 dec.	1.972 dec.	91.4 dec.
Difference in man-hrs. per 100 sq. ft.	.344 dec.	86.9 dec.	.417 dec.	82.3 dec.
Difference in cost per 100 sq. ft.	$.269 dec.	36.2 dec.	$.099 inc.	15.9 inc.

The decrease in the amount of paint applied per unit area with the hand brush method indicates a considerably thinner paint film than that obtained with the spray method. Also, the character of the surface of the brush film is not as smooth and uniform as that of the spray film, due to the minute grooves made by the bristles of the brush. In view of these facts, it is highly probable that the spray film will prove to be the most durable and may be more economical in the end than the brush film.

It is concluded that the results of this test demonstrate rather conclusively the economy of spray painting as compared to the hand brush method, when applied to large surfaces. It should be borne in mind that the weather conditions during the test were rather severe, with a strong wind blowing most of the time. This tends to increase the paint consumption with the spray method, as much of it is blown away and lost.



Wide World Photo

Conclusive Evidence of High Temperatures—What Happened to a Portion of the Chicago Rapid Transit Structure in the Heart of the $8,000,000 Stock Yards Fire at Chicago on May 19

Rail Orders Now Total 703,579 Tons

THE purchase of 35,000 tons of rail by the Chesapeake & Ohio and 10,000 tons by the Reading, and the announcement of an order for 25,000 tons placed by the Union Pacific, together with the granting of a P. W. A. loan of $1,550,000 to the Boston & Maine for improvements to roadway and structures and the purchase of signal equipment, and a loan of $3,500,000 to the Escanaba Iron Mountain & Western (a subsidiary of the Chicago & North Western) for the construction of an ore dock at Escanaba, Mich., are the latest indices of the expansion in expenditures for roadway and structures that is now in progress. The loan to the B. & M. supplements an earlier loan of $2,330,000 for the purchase of rail, track accessories, etc.

Schedule of P. W. A. Loans for Roadway and Structures

Railway	Amount	Purpose
B. & O.	$ 1,500,000	rail, accessories and labor
B. & M.	3,780,000	rail, accessories and maintenance work
Cent. of Ga.	120,000	rail and accessories
C. & E. I.	240,000	rail and accessories
C. & N. W.	1,400,000	rail and accessories
C. M. St. P. & P.	2,317,000	rail and accessories
Erie	2,671,000	rail and accessories
Ft. Smith & West.	75,000	tie and trestle filling
G. T. W.	250,000	rail and accessories
G. N.	3,108,000	rail, accessories and other items
I. C.	2,685,000	rail, ties, bridge and tunnel work
K. O & G.	255,000	rail and accessories
Me. Cent.	313,000	rail and accessories
N. Y., N. H. & H.	1,300,000	rail and accessories
N. Y. C.	2,500,000	rail, accessories and labor
N. Y. O. & W.	235,000	rail and accessories
N. P.	245,000	enginehouse and bridge work
Penna.	6,030,000	rail, accessories and roadway improvements
P. & W. Va.	47,000	rail and accessories
S. P.	6,771,985	rail, accessories, ties and bridge work
Wabash	573,506	rail and accessories
	$36,416,591	

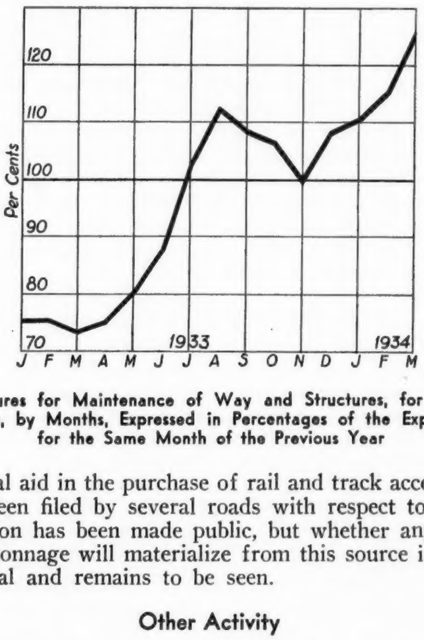
More tangible evidence of the expansion of programs is now available in the reports of the maintenance of way expenditures of the Class I railways for the first three months of 1934, which amounted to $78,789,511, compared with $66,925,498 in the first three months of 1933, or an increase of 17.7 per cent. However, what is more significant is the marked rise in the percentage of increase from month to month. Thus, in January the increase was only 11.1 per cent, in February it was 16.6 per cent, while in March, the expenditures were $28,507,738, compared with $22,629,337 for March 1933, an increase of 26 per cent.

While there is no doubt that the increase in expenditures has been stimulated by the loans granted by the Public Works Administration, the real impetus has been the increase in railway earnings, and while the fund set aside for loans to the railways has not yet been exhausted, it is to be expected that the roads will finance their enlarged appropriations more largely from corporate funds in the future. To date 21 railways have been allotted $36,417,000 for the maintenance and improvement of roadway and structures in the form of loans from the Public Works Administration. As shown in the table, the larger proportion of this sum is being expended for rail and track accessories, but as will be noted also, considerable sums have been provided for the purchase of ties, for bridge and building work, and for general maintenance purposes.

The 38 railways listed last month as having ordered 633,579 tons of rail since October 1, 1933, has been amplified by the addition of the Chesapeake & Ohio, the Reading and the Union Pacific, which have purchased 70,000 tons. As the record now stands 16 railways have purchased 407,812 tons of rail with federal funds, while 25 railways have ordered 295,767 tons for which no loans have been obtained, although two of them have filed applications for loans on which no action has yet been announced.

In addition to the 703,579 tons of rail for which orders have been placed, three railways have obtained loans for rail purchases but have not yet placed their orders. These are the Central of Georgia, 3,000 tons; the Grand Trunk Western, 4,250 tons; and the Kansas, Oklahoma & Gulf, 5,186 tons, and the fulfillment of their needs will bring the total to 716,015 tons. This is an increase of 68,248 tons over the corresponding total recorded in last month's issue.

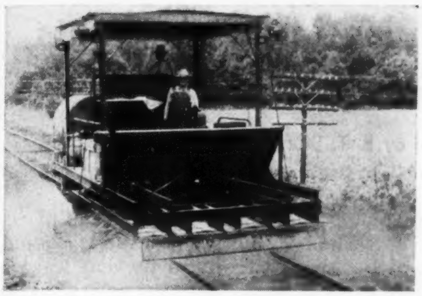
It is of course, impossible to hazard any estimate of probable further additions to the rail tonnage in the near future. According to a tabulation issued by the Public Works Administrator some time ago, applications for financial aid in the purchase of rail and track accessories have been filed by several roads with respect to which no action has been made public, but whether any additional tonnage will materialize from this source is problematical and remains to be seen.



Expenditures for Maintenance of Way and Structures, for Class I Railroads, by Months, Expressed in Percentages of the Expenditure for the Same Month of the Previous Year

Other Activity

While the effect of the government's policy in fostering greater activity in maintenance of way work through the granting of federal loans, has served to place primary emphasis of expenditures for roadway repairs and replacements, considerable attention has been given to bridge and building work, an outstanding example being afforded by the allotment of $1,273,125 to the Illinois Central for work on two large bridges and the lining of a tunnel. There is evidence also of greater activity in the field of water treatment. Thus, the Nickel Plate has recently awarded a contract for a water softening plant at Frankfort, Ind., another road is seeking federal funds for improvements in the quality of water, still another road is making studies pointing to the installation of several new facilities, while a fourth railway is considering the construction of a plant at a point of large water consumption.



Does the use of oil-burning weed destroyers cause a loss of preservative in treated ties in the track? For all practical purposes the answer is in the negative, according to the results of tests conducted over a period of years by a subcommittee of the Committee on Wood Preservation of the A. R. E. A. The final report on this subject was presented at the March, 1934, convention of the A. R. E. A. at Chicago and is abstracted herewith. As in its previous reports, the subcommittee concluded that "all experiments thus far seem to indicate that little actual loss of preservatives may be expected from normal operation of weed-burning machines."

Weed Burners—Do They Injure Creosoted Ties?

EXPERIMENTS to determine the loss of preservative, if any, in treated ties due to the use of oil-burning weed destroyers were conducted on actual test specimens inserted in track and subjected to the action of weed burners. The test specimens consisted of 2-in. by 8-in. by 8-ft. pieces cut from 6-in. by 8-in. by 8-ft. ties of thoroughly air seasoned white oak, red oak, hard maple, beech, sycamore and southern yellow pine. One piece was cut from each face side of each tie and the heart center eliminated. These were treated with either A. R. E. A. Grade 1 distillate oil, an 80-20 mixture of Grade 1 creosote and coaltar, or a 45-55 mixture of Grade 1 creosote and California crude-oil, by the Lowry and Reuping processes, with the final retention of preservatives varying from 3 to 10 lb. per cubic feet of wood. The retention of preservatives was determined by carefully weighing each piece before and after treatment. One piece from each tie was placed in track and subjected to the operation of the wood-burning machine, while the other piece cut from the same tie was placed in an adjoining track over which the weed burner was not operated. Those pieces that were not subjected to the operation of the machine served as a mean of determining natural changes occurring during the course of the experiment, such as changes in the moisture content and loss of oil by evaporation. All test pieces were carefully weighed before each operation of the oil burner and reweighed immediately afterward.

Three Groups of Test Specimens

The test specimens were divided into three groups, according to the kind of wood used. One group, consisting of a total of 50 pieces, contained specimens of pine, white oak, red oak and other hardwood, while another contained 42 pieces, all southern pine. The third group consisted of 40 pieces of hard maple. In the first group the weed-burning machine was operated over one-half the specimens on four different occasions, the dates being September 2, 1930, July 27, 1931, September 2, 1931, and October 14, 1933. The second group was subjected to six burnings, which took place on August 24, 1931, September 5, 1931, September 7, 1932, September 16, 1932, July 26, 1933, and August 5, 1933. The third group was subjected to three operations of the weed burner on August 17, 1931, August 8, 1932, and July 20, 1933. The results of the tests in all three groups were uniform in showing that the loss of preservative in the specimens subjected to the effects of the weed-burning machine was not appreciably greater than in the pieces that were not affected by the machine.

In addition to the foregoing tests, similar experiments on a somewhat smaller scale were conducted last year on the Chicago, Rock Island & Pacific. While figures regarding these tests are not available at this time, the results are reported to show that practically no loss of preservative took place due to the operation of the weed-burning machine.

Test on Rock Island

It has been suggested that weed burners might have a more damaging effect on the portions of the ties outside the rails, as heat from the burners seems more intense here than in the center of the track. To develop information on this subject, the Rock Island placed two full size 6-in. by 8-in. by 8-ft. creosoted gum ties in track parallel to the rail at the ends of the track ties, and subjected these to the effects of the weed-burning machine. The results of this test are given below.

	Weight before Burning lb.	Weight after Burning lb.	Loss in Weight lb.
Hewn	143.75	143.65	0.10
Sawn	120.25	120.00	0.25

Because of the low heat conductivity of wood and the extremely short period in which the heat is applied to the ties by weed-burning machines, it is the opinion of the committee that flames from the machine affect only the portion of a crosstie near the surface of the face side. In the light of this suggestion, extractions of creosote were made from two matched test pieces, one of which had been subjected to the weed-burning machine eight different times, and the other not at all. Analyses of the oil obtained from these pieces, together with that of the oil used in treatment are shown on the next page.

From the following tabulation it is seen that there was little difference in the character of the oil remaining in the test pieces.

The results of these experiments would seem to bear out the opinion of the committee, as expressed in previous reports, that the loss of preservative from treated ties

Analyses of Creosote Oils

Imported distillate, original oil		From burned section of test piece		From section not burned	
Up to 210°C	2.80	Up to 210°C	1.90	Up to 210°C	4.10
210° to 235°	14.30	210° to 235°	1.20	210° to 235°	1.00
235° to 315°	35.20	235° to 315°	5.85	235° to 315°	6.70
315° to 355°	20.00	315° to 355°	33.45	315° to 355°	30.50
Residue (Soft)	27.50	Residue (Soft)	55.20	Residue (Soft)	54.80
	99.80		97.60		97.10
Loss	.20	Loss	2.40	Loss	2.90
	100.00		100.00		100.00
Water, 1 per cent Specific Gravity—1.065 at 38 deg. C.		Water, Trace, Specific Gravity—1,1036 at 38 Deg. C.		Water, Trace, Specific Gravity—1.1052 at 38 Deg. C.	

by weight may be considered almost negligible. In fact, the figures show an almost equal decrease in weight for pieces which were not subjected to the weed-burning machine as in the case of those that were burned.

Effect Decreases with Age of Ties

In the course of the experiments conducted by the committee it has been noted that the effect of weed-destroying machines on treated ties, as regards the loss of preservative, diminishes almost directly in proportion to the age of the ties in track. This is particularly true of ties of the hardwood group. Ties that have been in service more than three years are rarely affected unless they are mechanically worn or damaged by derailments. Old ties that are so damaged and worn are more often affected by the second burning because then the flame is also communicated to the tie from burning grass and vegetation.

The speed at which machines are operated is governed by the kind and growth of the vegetation but at the average operating speed the ties are subjected to the heat not more than 1½ sec. It is of particular importance that weed-burning machines be operated at the specified speed. Often, the rate of travel is lower than that required to meet weed conditions and the possibility of damage to the ties is thereby increased. This occurs most frequently when the machine is being operated in yards or on sidings where the vegetation is sometimes much heavier than on main line track.

Untreated Ties Ignite More Readily

Untreated ties ignite much more readily than creosoted ties and burn freely, particularly if they show any splintering, or if decay has developed. The burning of such ties may be considered beneficial rather than detrimental as this destroys incipient fungus growth. As a good many ties ignite either from the machine or from burning grass and vegetation, it is of utmost importance that track gangs follow the machine closely for the purpose of extinguishing such fires as quickly as possible. Weed-burning machines should not be allowed to stand in one place immediately after the flame has been shut off, as the heat radiating from the apron will damage the ties underneath the machine.

In many cases there seems to be more free oil on the outside of the ties after the weed-burner has passed than before. This adds a protective coating to the tie which probably retards volatilization of the lighter fractions of the preservative and should prevent checking to some extent. The kind of ballast used and the manner in which it is dressed have much to do with the effect of weed-burning machines on ties, the effect being lessened in proportion to the amount of protection provided by the ballast.

Applying Insulated Joints Requires Care*

By E. T. SCHEMERHORN

Manager, Insulated Joint Department, Rail Joint Company, New York

IN addition to joining and supporting the ends of adjacent rails as ordinary joints do, insulated joints must also guard the track circuits to prevent leakage of electric current from these circuits into adjacent track sections. This makes it necessary to introduce a blanket of insulating material, generally of specially prepared wood fibre, between the rail ends, the rail and the joint bars and between the rail and the bolts, to insure that there will be no contact between the metal of the rail and that of the fastenings. Since improper or careless installation and later maintenance of this insulation may result in signal failures, most railways recognize the importance of emphasizing the particular care that is required in the application and maintenance of insulated rail joints.

As evidence that this need is widely recognized, many of the roads have issued both standard rules and special instructions to be observed by the track and signal forces. On some roads these rules and instructions are included in the "Book of Rules" governing these departments; on others they are issued in special pamphlet or blueprint form. It has been demonstrated repeatedly that an intelligent and thorough observance of such instructions will materially prolong the life of the insulating material, will prevent damage to the rail ends and will avoid the necessity for frequent renewal of the joints. At the same time it will insure efficient operation of the signals, so far as this is affected by the condition of the joints.

There are many instances of insulation lasting as long as 10 years in well-maintained track that is laid with heavy rail, where proper methods of application and maintenance have been employed. There is no reason why any road cannot secure an average life of five years from the insulation in modern insulated joints, provided track conditions are normally good and the proper precautions are observed in its application and maintenance. Despite this, however, there are many instances where this average is not attained. For this reason, it may be well to restate the principles involved, which are embodied in the following typical rules which should be followed if the desired results are to be obtained.

Rules for Applying Insulated Joints

1. An insulated joint should not be applied on cut or battered rails. If this is done, the fibre will be damaged. By turning the rails around or passing them by each other, good rail ends can usually be placed in the insulated joint.

2. Before applying the joint, all sharp edges, scale, rust and dirt should be removed from the joint bars and from the rails within the limits of the joint. An application of clean oil to the rails and joint will help to resist rust and corrosion.

3. Joints should not be applied where the opening between the rails is too great. If too wide, the gap should be closed so that the fibre end post just fills it. Otherwise, damage will result to the bolts and bushings.

*This discussion was submitted for publication in What's the Answer department of the May issue, but because of its scope it was withheld for presentation here as an independent article. For further discussion of this subject see page 283 of the May issue.

4. Bolts should not be driven through fibre bushings, since this will damage the bushings. If the rails and joint parts are in the proper position and the bolt holes are lined up, the bolts can easily be inserted by hand.

5. Care should be exercised to insure that the fibre end post is of the same section as the rail. If it projects above the top of the rail, it should be trimmed carefully to bring it flush with the top of the rail, before the first train passes over it. This will prevent crushing the fibre and opening it to the weather. An end post that is made slightly lower than the top of the rail will be free from damage by wheels and from the operation of removing lips from the rail ends.

6. It is important to support the joint uniformly at all points on smooth-faced sound ties and to keep the joint and shoulder ties tamped solidly at all times with clean well-drained ballast. Otherwise, pumping and churning will result and cause excessive wear of the fibre. Where rails are laid on canted tie plates, a special abrasion plate having the same cant should be used on each tie under the insulated joint. If this is not done, the twist given to the rail and joint as the wheels pass over it will increase the wear on the insulation and cause the base of the joint to cut into the ties.

7. Bolts should be kept tight at all times. It is particularly important that they be tightened frequently after the joint is applied, until all parts have become firmly set. As they are tightened, the lower shoulder of the bar should be tapped over its full length with a maul. This will avoid cocked joint bars and will insure an even bearing on all of the insulation. In applying and maintaining the joints the center bolts should always have a slightly greater tension than the remainder.

8. If the rails creep, so that the opening between the rail ends is either increased or decreased, the rails should be driven back in the proper direction and firmly anchored by applying a sufficient number of anti-creepers to stop the movement. Insulating fibre is not able to withstand the crushing forces of creeping track.

9. Rail ends should not be forced apart with a track chisel. Doing this damages the rail ends and leaves rough edges which will destroy the fibre end post. If a chisel must be used for this purpose, one should be selected which is wider than the rail head and has a small taper, as such a tool will be less likely to damage the ends of the rails.

10. When lips are being removed from the ends of rails, great care should be exercised to avoid damaging the fibre end post. It is now considered beneficial to bevel the rail ends slightly, but in doing this, damage to the fibre end post must be avoided if the joint is to function properly.

11. All parts of the joint should be kept dry and clean when not in use. Rusted bars and weathered fibre give poor results. Insulating fibre will warp and change its shape if exposed to the weather, or to considerable dampness, when it is not confined in the joint. Deformed fibre produces an ill-fitting joint, which results in shortened life for the insulation.

12. Heat treating or the building up of the rail ends by welding will burn the fibre and render it unfit for further service. Where work of either type is necessary, the insulated joint should be removed before the work is started, or all insulation must be renewed immediately after it is completed.

To the foregoing rules another might be added with profit: *It is false economy to use second-hand insulated joint bars on new rails.* This was formerly recognized as a sound rule, and probably still is so considered by experienced maintenance officers. Unfortunately, however, as a result of the insistent demands for economy in expenditures during the last four years, in not a few instances judgment has been over-ruled by necessity.

Second-hand non-insulated rail joints have rarely, if ever, been used on new rails, except when reformed and refitted by some special process, and there can be no sound basis for assuming that insulated joint bars can be made to perform more satisfactorily when used in this manner. After a period of hard service, insulated joint bars become more or less set to the conditions existing at the points of use. When they are removed from the old rail and reapplied on new rail, the original uniform bearing on the surfaces of the insulation is not reproduced. The formation of rust and scale on the old bars adds to the inequalities of the bearing surfaces upon the insulation, and aggravates the lack of proper fit at all points. These deficiencies of uniform bearing produce excessive wear on the insulation at certain points and contribute to the damaging of the ends of the new rail.

In any event, if a second-hand bar must be used, all bearing surfaces should be tested with a straight edge before it is applied in its new location. If it is found that its bearing surfaces are not substantially straight, it should not be used.

Should Rails on Curves Be Transposed?*

By C. W. BALDRIDGE
Assistant Engineer, Atchison, Topeka & Santa Fe, Chicago

IN PRACTICALLY all situations, the rails on curves of four degrees and sharper, and in many cases on curves between two and four degrees, wear to such an extent that they should be transposed in order to obtain the maximum service life from them. During the time when Bessemer steel was used in the manufacture of rails, transposal of the rail was usually made necessary by the side wear on the head of the high rail, since owing to the hardness of the steel, the low rail received relatively little wear and did not flatten out to the extent that modern open-hearth rails do.

Since open-hearth rails have come into universal use, the low rail flattens more rapidly than the high rail wears, especially where the curves are elevated for high-speed trains. For this reason it is advisable to transpose the rails while the one on the low side is still suitable for reuse on the high side. The high rail, when transposed to the low side, offers greater resistance to flattening than new rail, since it has undergone a process of cold rolling by the passing wheels, and the surface in contact with the wheels is case hardened. The process of flattening is further retarded by reason of the fact that the worn head is narrower than that of a new rail of the same section, which insures that fewer false flanges will ride the head of the rail and it is the false flanges of worn wheels that cause most of the flattening of the head of the low rail on curves.

It is difficult to define the point at which the rails reach the stage where the amount of wear makes it

*This discussion was submitted for publication in the What's the Answer department in the March issue, but because of its scope it was withheld for presentation here as an independent article. For further discussion of this subject see page 165 of the March issue.

necessary or appropriate to transpose them. Some railways have adopted rules which require this to be done when the side wear on the head of the high rail has reached a specified amount; others specify that the transposal shall take place when the low rail has flattened to a certain width; still others make the decrease in the height of the low rail the basis for making the change; and in some instances the matter is left to the judgment of the local officers.

Frequently, conditions other than wear make it desirable to transpose the rails. Among these, the development of head checks or detailed fractures are the most important. Others include the degree of the curve, the amount of superelevation, the speed of trains, the volume of traffic, the importance of the track in which the rails are laid; and extra hazards because a river, other tracks, important structures, etc., are closely adjacent to the curve.

In view of all of these factors it is generally best to depend on the judgment of experienced maintenance officers, two or more of whom agree, after careful inspection, that the transposal should be made or that the rail should be allowed to remain in its original position for some time before it is changed over.

When making the transposal it is usually best to set the high rail over without turning it, thus placing the old gage side on the outside in its new position as the low rail. On the other hand, the low rail should be turned, so that the old gage side will continue to be the gage side in its new location. The reasons for this are that the high rail has been given a set by the effect of traffic and thus retains its curvature when removed from the track, while the outside of the head is usually in good condition, seldom showing any evidence of flow and thus providing a good gage line. In contrast, the rails from the low side reverse their curvature, owing to the compression which has taken place in the metal on the gage side of the head. Consequently, by turning these rails, the curvature in the rail more nearly fits the curvature of the track. A further reason for turning the low rails is that there is usually a considerable overhang of flowed metal along the outside of the head, making it difficult, and at times impossible, to obtain correct gage unless they are turned. Again, if the low rail is not turned, the reversal of the curvature that it has assumed will tend to open up all of the head checks or other flaws that had begun to develop because of its original position in the track.

Are There Any Disadvantages?

There is one disadvantage of some consequence. Owing to the difference in the length of the inner and outer rails on curves, the shorter total length of the inside rails must replace the longer outside rails, while the longer outside rails make the difference double the original difference in the length of the two as they are laid in the track, and the proper spacing of the joints becomes a real problem in the great majority of cases presented.

On standard-gage track, the rail on the outside of the curve is approximately one inch longer than the inside rail for every degree of central angle. In making the change, therefore, the joints in what was the high rail will run far ahead of those in the rail from the low side when it is laid in its new position. To avoid too much adjustment, a convenient rule is to keep all joints within the middle third of the opposite rail. This is not a good rule when laying new or released rail, but because some compromise is necessary, it can be applied to advantage when transposing rails.

Syntron Develops "Heavy Blow" Tie Tamper

TO MEET the need for a tie tamper capable of striking a blow sufficiently heavy for light-lift spot tamping, the Syntron Company, Pittsburgh, Pa., has developed its "Heavy Blow" electric tie tamper. This tamper, which is similar in design to previous models of Syntron tie tampers, produces a blow of high impact; it is said, for example, to be capable of driving a cut spike into an unbored treated hardwood tie to a point where the head of the spike is within an inch of the surface of the wood. It is also claimed that when this tool has been applied to out-of-face tamping with a lift of 1 to 1½ in., it has not only speeded up the work but packed the ballast more solidly under the ties.

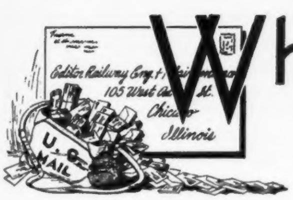
The Heavy Blow tie tamper consists of a simple solenoid electric hammer in which the piston strikes the

Showing an 8-Tool Outfit of Heavy Blow Tie Tampers in Operation

shank of the tamping bar a direct blow. The magnet of the tamper is energized by a pulsating current which is derived from 25-cycle, single phase alternating current by means of special controllers. This current has 1,500 pulsations per minute, every second one of which acts to pull the piston of the tamper downward, thus giving 750 blows per minute on the tamping bar.

Electric current for these tampers is furnished by small portable gas-electric sets when they are operated in 2, 4, 6 and 8-tool outfits. When 12-tool and 16-tool outfits are used, the current is supplied by generators mounted on flanged wheels or on tractors.

Looking West Toward the Station Facilities of the Delaware, Lackawanna & Western at Elmira, N. Y.



What's the Answer?

Send your answers to any of the questions to the What's the Answer editor. He will welcome also any questions that you may wish to have discussed.

Section for Churning Gravel

Where pit-run gravel tends to churn, how should the ballast section be dressed? Why?

Should Be Dressed to Minimum Section

By J. A. S. REDFIELD
Assistant Engineer Maintenance of Way, Chicago & North Western, Chicago

It is my belief that all ballast should be dressed to the minimum section that will afford track stability, with a slight amount of additional material available, however, to avoid reducing this section below this minimum as the track is surfaced from time to time. With pit-run gravel, or any other ballast of poor quality, if a tendency to churn is evident, I would use the spreader where practicable to cut to the minimum section permitted by the roadway standard for gravel ballast.

Churning Ballast Creates Difficulties

By District Engineer

It is generally conceded that where ballast is clean and drains freely, better surface and line can be kept if a full-ballast section is maintained. However, if the ballast does not drain freely, a full-ballast section, either temporarily or permanently, entraps and holds water around the ties, as a result of which churning is certain to ensue, and no amount of routine surfacing will then keep the track in good riding condition. It is apparent, therefore, that here, as in so many other details of track maintenance, drainage is of paramount importance.

Experience has shown that where the ballast material is of the type implied in the question, much benefit can be obtained in many cases by dressing it to conform in some degree to the way unballasted track is dressed. In this way it will shed a considerable part of the water that falls as rain or reaches it as melted snow, most of which would be retained by a full section with the normal shoulder.

This dressing will vary somewhat with the material and with local conditions. A typical section, however, will have the ballast slightly above the tie at the center of the track, from which point it will slope to about, or a little below, the middle of the tie at its end, continuing on this slope for several inches and then sloping more abruptly to the roadbed.

This section has the advantage of reducing the amount of water held in the ballast, while at the same time affording some support to the tamping outside of the rail. Furthermore, the ties are more easily "bled" if this becomes necessary. Many foremen find that they can maintain track in such ballast by tamping the ties from the end, and the suggested section facilitates this operation.

Among the disadvantages, there is seldom sufficient reserve of ballast to permit extensive surfacing, even of routine character. The ends of the ties then easily become loose, creating a tendency toward center-bound track, so that constant attention is required. While it is sometimes necessary to use ballast of this character, there is seldom any economy in doing so. Certainly it should never be used on an important main line.

Should Be Given Maximum Slope

By H. E. HERRINGTON
Section Foreman, Minneapolis & St. Louis, Jordan, Minn.

Wherever pit-run gravel is used as ballast, the ballast section should be developed to insure the best surface drainage. To do this, the cribs should be filled in from 1½ to 2 in. above the tops of the ties at the center of the track, and sloped to about 3 or 4 in. below the tops of the ties at their ends. This slope will clear the base of rail and allow surface water to drain away rapidly.

Pit-run gravel usually contains varying quantities of earth and fine sand, which tend to shift under traffic, especially at joints and rough spots. Holes are thus formed in the ballast section, in which water collects and stands, thus causing sloppy track. An ample supply of ballast should be available at joints, and here the ballast

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To Be Answered in August

1. *Where only part of the ties in a turnout require renewal, should the entire set or only the failing ties be replaced? Why? If the former, what disposition should be made of the sound ties that are recovered?*
2. *What is the most satisfactory method of handling freshly creosoted stringers, caps, sills, piling and other heavy timbers? What precautions should be observed?*
3. *Where tie renewals are heavy and new rail is to be surfaced immediately, should anti-creepers be applied by the rail gang or by the surfacing gang? Why?*
4. *What are the advantages and disadvantages of ordinary paint and bronze paint for radiators? How is the heating value of the radiators affected?*
5. *Where stone ballast is churning and a general cleaning is not practicable, what action should the section forces take? Why? How should they go about it?*
6. *How is the quality of water for locomotive use affected by a prolonged dry spell, where the supply is taken from streams? What remedial measures should be taken? What is the effect on small streams when the dry spell is followed by light rains?*
7. *What simple rule can be employed to determine the number of rails in a given number of tons? To determine the tonnage of a given number of rails? To determine the number of tons in a mile?*
8. *Where traffic must not be interrupted, how should one go about replacing a floor beam in an open-deck single-track through truss span? A double-track span without a center truss?*

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section should be kept filled out. This is where the trouble with churning usually starts and considerable material is required for maintenance.

I have found that end tamping of joint ties is a marked advantage when pit-run gravel that tends to churn is in use. The reason for this is that the ends of the ties can be kept tamped solidly without disturbing the material in the cribs, and without pounding the ballast to dust to get it under the tie.

▼ ▼ ▼

Primer for Roofing

Where built-up asphalt or tar roofing is applied to concrete or gypsum roof slabs, should a primer be used? Why? If so, what kind of primer should be used with each?

Required for Asphalt But Not for Tar

By FRANK R. JUDD

Engineer of Buildings, Illinois Central, Chicago

It is generally accepted that a primer is required when built-up asphalt roofing is applied to concrete or gypsum roof decks, but that a primer is not necessary when built-up tar roofing is applied to these surfaces. In the case of asphalt roofing, the primer is necessary to obtain a bond between the roofing asphalt and the deck. Otherwise, a bond is impossible because of the film of fine powder-like dust which forms on the surface of both concrete and gypsum slabs, and which it is nearly impossible to remove. Experience has shown that this film of dust does not interfere with the bond of tar or pitch to concrete or gypsum, and for this reason a primer is not necessary with these materials.

An asphalt primer should be of the same quality and have the same characteristics as the asphalt used for coating the roof. It should be cut back or fluxed, however, to give it the proper consistency for use. The melting point of the primer should be such that when the hot asphalt is applied for mopping the surface of the roof deck, the two asphalts will amalgamate immediately.

A Bond Should Be Maintained

By Supervisor of Bridges and Buildings

As contrasted with wood sheathing, where it is important that there be no adhesion between the roofing and its support, I believe that a bond is desirable between a built-up roof and the slabs of concrete or gypsum on which it rests. On this point, however, there is some difference of opinion.

I have constructed a number of gravel and slag roofs of both tar and asphalt types on wood sheathing and on concrete slabs. I have placed one asphalt roof on gypsum slabs, but have never installed a tar roof on this type of slab. I have always used an asphalt primer in placing asphalt roofs. In fact, it is next to impossible to secure a dependable bond between the roofing and the slab unless this is done. This is particularly true of gypsum slabs, since the surface dusts quite easily.

Coal-tar pitch adheres better than asphalt to a clean concrete surface that is warm, but in cold weather there is little difference between them in this respect. I have never seen a tar primer, but I have used creosote in several instances with apparently good results. Creosote should never be used with asphalt, however, as even small quantities affect it adversely.

One application of a primer is generally sufficient on concrete slabs, but I found it necessary to apply a second coat to the gypsum surface before I considered it satisfactory. While I cannot say what the effect might be of using creosote as a primer on gypsum slabs, a primer is certainly needed on a surface that dusts so easily. It is possible that, because of its porosity, the gypsum would take up enough creosote to cause staining on the under side of the slab.

Hot Pitch Generally Adheres without Primer

By A. L. SPARKS

Architect, Missouri-Kansas-Texas, St. Louis, Mo.

A primer should be used on concrete or gypsum slabs before asphalt roofing is applied, to insure a proper bond. There is generally a small amount of dust on the slabs that interferes with the perfect adhesion of the heavier asphalt coating, and it is customary to apply a coating of a cut-back mixture of asphalt and naphtha, which is more penetrating.

It is unnecessary to prime the slabs before applying pitch or tar, except where there is excessive dusting. In the latter event, some practical roofers use a coating of creosote as a primer. Cut-back materials thinned with naphtha or kerosene are also used. Hot pitch is generally sufficiently tenacious, however, to provide a satisfactory bond without the use of a primer.

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Disposing of Sludge

Where it is impracticable to discharge the sludge from a treating plant into a water course, what provision should be made for disposing of it?

Sludge Disposal Is an Annoying Problem

By E. M. GRIME

Engineer of Water Service, Northern Pacific, St. Paul, Minn.

This is one of the most annoying problems arising from the operation of lime-soda ash water-softening plants. Under certain conditions, such as crowded metropolitan areas, it may be the controlling factor in deciding on the type of plant to be constructed. If the sludge could be discharged directly into a city sewer, there would be no trouble. Most of the sludge settles out quickly, however, and deposits to fill the drain pipe within a comparatively short distance. In several instances, a line of 12-in. drain pipe only a few hundred feet long has filled within a few years, making it necessary to replace the pipe with open ditches which can be cleaned periodically.

When sludge cannot be disposed of otherwise, a good arrangement is to construct two pits, into one of which the sludge is discharged and allowed to settle, the clear water being drained off as fast as it accumulates. While one pit is in use, the sludge in the other is drying so that it can be loaded by a clamshell into cars and hauled to a dumping ground. If land is available, the dried sludge can be scraped out about once a year with teams, a drag line or other device and piled on the adjacent land. The amount of sludge to be handled will depend on the volume of water and the degree of softening required, and the size of the sump should correspond with this and the desired cleaning intervals.

Provision for sludge disposal is sometimes one of the important details in determining the type of treating plant to be adopted. In lime-soda ash plants, the total

weight of the dry sludge is, roughly, 2/7 lb. per grain of hardness removed per 1,000 gal. of water softened. A plant softening 350,000 gal. of water per day, of 25-grain hardness, will accumulate more than a ton of sludge a day, which is equivalent to 6 cu. yd. of wet material. If sludge removal costs $0.50 a cu. yd., there will be an additional cost of approximately one cent per 1,000 gal. for treatment by reason of this feature. In certain situations, considering the cost and annoyance of handling the sludge, it may be more economical to use the zeolite treatment, since there will be no sludge and the soluble effluent from a plant of this type can be disposed of in any sewer.

Sludge Basin Best Solution

By J. T. ANDREWS

Assistant Engineer, Baltimore & Ohio, Baltimore, Md.

Where sludge cannot be discharged into a stream or sewer, the most effective means of disposal is to discharge it into a sludge basin, preferably of such size as to avoid the necessity of cleaning too frequently. It is usually possible to find space for such a basin, which may be formed by erecting dikes, utilizing material excavated from the bottom to build up the earth walls. In some cases, by taking advantage of topographical conditions, basins can be provided with only a small amount of work.

Size will be governed by the capacity of the treating plant and the amount of solids contained in the raw water, which are discharged in the sludge. The dikes should be high enough to allow a fairly long settlement before building up to the overflow, which should be provided to permit the clarified water to pass off after the solid matter has settled out. If the basin is of the proper area and height, the overflow will be quite clear and, if drawn off at the top of the basin, may be discharged into any water course or even into a right of way ditch. If the basin is small, however, a baffle may be required to minimize the surging of the incoming sludge, and the consequent retarding of the settling of previous sludgings.

Since the residual solid matter will gradually build up in the basin, it will eventually have to be cleaned out and hauled away. If the area available for the basin is small, such cleanings must be frequent and the cost of disposal will be increased. It is an advantage, therefore, to make the basin large if space permits. It has been our experience that a basin can be built at reasonable cost that will be of sufficient size to provide for several years' settlement before cleaning is necessary.

Settling Basins Have Proved Satisfactory

By Supervisor of Water Service

In many cases the disposition of sludge from a lime-soda ash plant is relatively simple, being largely a matter of keeping the drainage line open. In a large number of instances, however, it becomes a real problem because of physical limitations as well as cost. Where long drainage lines are required, the volume of water necessary to keep the sludge diluted and flowing at a velocity that will prevent settlement in the pipe, may be the limiting feature. In other cases, particularly in connection with reservoirs or in large towns, there may be no water course available or, if available, the dumping of the sludge into the stream may be prohibited. In still others, water rights below the pumping station may prevent this method from being used.

Where, for any of these reasons, it becomes impracticable to discharge the sludge into a natural or artificial watercourse, probably the most satisfactory alternative is to construct a sedimentation basin of sufficient capacity to hold one or more year's accumulation of sludge, depending on the amount of solids that must be removed from the water. If it is practicable to install twin basins, the problem of removal will be somewhat simplified, since when one basin is filled the discharge can be turned into the other and the accumulated sludge allowed to dry before it is removed.

If the topography is favorable, these basins can be constructed at small cost, sometimes at the head of a gully, in a natural depression or even on flat ground. Since the flow of water is limited, a relatively low dike around the basin is usually all that is necessary. Considerable surface area is preferable to depth, although conditions sometimes make a restricted area and considerable depth necessary. The earth for the dikes can be taken from the bottom of the basin, which should be left approximately level, thus increasing its capacity for storing the accumulation of sludge.

One of the main considerations is to design the basin so that sedimentation will be complete and the effluent clear. In fact, if best results are to be obtained, the effluent should be of such a character that it can be reclaimed and used as a part of the locomotive supply. In some sections of the country where the supply of water is limited, this becomes a matter of some consequence. Occasionally it is necessary, in order to forestall damage claims from adjacent land owners.

After the basin is filled, the next problem is to dispose of the accumulated sludge. If a track is available, it can be loaded on cars and hauled to some convenient dump. Failing this facility, it can be loaded into trucks for final disposition. In several instances with which I am familiar, farmers in the neighborhood have been glad to clean out the basins in order to get the sludge which they spread on their land to counteract the acidity of the soil.

Sludge Beneficial to Sour Soils

By C. P. RICHARDSON

Engineer Water Service, Chicago, Rock Island & Pacific, Chicago

In general, where sludge cannot be discharged into water courses, sludge sumps or disposal cars set on convenient tracks offer the best solution. Sumps may be classified in two groups, depending on soil conditions and the availability of natural drainage. Where drainage by seepage, natural surface flow or sewer outlet is available, a sump of sufficient size to allow cleaning twice a year is generally the most practical and economical. If none of these drainage outlets is available, water-tight pits may be constructed, with two or more compartments of baffle construction. The clarified water is then repumped to the softening plant, while at the proper time, the sludge must be loaded into cars and disposed of along the right of way or at other sites available for dumping.

Sludge-disposal cars are standard tank cars equipped with 8-in. quick-opening valves placed at each end of the car but on opposite sides, and with a 2-in. perforated pipe inside the tank, extending its full length near the bottom. To empty the tank, a connection is made between the 2-in. pipe and the blow-off cock of the locomotive. The steam and water blown through the pipe agitate the sludge, and the 8-in. drain valves are opened to empty the tank.

In cold climates the pits must be covered or be of sufficient depth to allow the placing of the sludge pipe below the ice level. The drainage outlet must also be adjusted to climatic conditions.

Where municipal sewers are available, it is common practice to utilize them as outlets, particularly where the plant connection is located below the built-up section of the town and reasonably near the point of outfall. Considerable benefit is sometimes obtained from the sludge as a purifying agent, particularly if the outfall is into a small stream. It is necessary, however, to use a relatively large quantity of water to dilute the sludge for the purpose of preventing deposits in the sewer.

Sludge is largely calcium carbonate with some magnesium hydrate, sand and other suspended matter. There are several commercial uses for reclaimed sludge, but none of economic value. It can be reburned to lime, but the cost of doing this is prohibitive. It is suitable for whitewash, but is not as economical as ordinary lime. It is beneficial to sour, or acid, soil and in some localities nearby farmers will remove the greater part of the accumulation if it can be stored to suit their convenience. With proper advertising of its agricultural value, this method of disposal may offer an opportunity for future economies.

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Anchoring Pipe Posts

How should posts of pipe railings or fences be secured to concrete supports, such as walls, sidewalks on bridges, etc., to insure effective anchorage and guard against cracking of the concrete from anchor-bolt holes, particularly where the sections are thin?

Would Vary Treatment

By CHARLES H. HITCHCOCK

Designing Engineer, Reading, Philadelphia, Pa.

In accordance with past successful results, in thick sections of monolithic concrete I would recommend drilling the holes for swedge, or anchor, bolts in the completed concrete, using a template to insure accurate location of the holes. After placing the bolts in proper position, the holes should be filled with melted sulphur. Where the slabs are thin and there is a possibility of cracking the concrete if holes are drilled after it has hardened, I recommend placing the bolts in position in the forms and depositing the concrete around them. If inserts are used, I recommend the same practice for both thick and thin sections, as outlined for thin sections.

Anchorage Should Be Adequate

By C. H. WOODRUFF

Draftsman, Engineering Advisory Committee, Chesapeake & Ohio, Cleveland, Ohio

While most hand rails are not particularly stressed, cases of failure have occurred with disastrous results. It has been shown that a crowd of men pushing against a fence produced a pressure of approximately 170 lb. a lin. ft. This indicates that where crowds are likely to gather, special precautions should be taken to insure that the anchorage is adequate. The details should be such as to facilitate replacement and should include waterproofed joints around the posts. A suggested detail for thin slabs comprises a pipe post of sufficient length to extend through a hole provided for this purpose, the pipe to be threaded so as to pass through a flange on the upper surface and into a similar flange on the under side of the slab.

For thin walls a more liberal use of posts will prevent too great a concentration of stress. Double extra-heavy sections of pipe offer a solution to the problem of replacement. In this case, there should be cast integrally with the wall or other member, a section of double extra-strength pipe which has been threaded internally to match the threading on the post. The assembly should include a floor flange which is to be brought to a full bearing after the post is screwed into the pipe insert.

Thinks a Lead Anchorage Best

By J. W. BOGGS

Road Mechanic, Chesapeake & Ohio, Maysville, Ky.

Posts for pipe railing can almost always be given sufficient anchorage by using heavy floor flanges, the latter being secured by means of relatively small anchor bolts set in drilled holes and leaded in. If a more secure anchorage is required, a thimble consisting of a section of pipe next larger than the post, can be set in the concrete and the post placed in this. In this case also it is better to drill a hole for the thimble and lead it in. I have never had the concrete crack where this method was used. After the post is placed, the space between the post and thimble should be sealed to prevent the entrance of moisture.

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Where to Spike

When regaging track or laying new rail with the same base as that being released, on ties that are prebored, should the spikes be redriven in the old holes or driven in the unused ones? Why? If the latter, should tie plugs be driven into the old holes? Why?

Three Reasons for Regaging

By J. C. PATTERSON

Chief Engineer Maintenance of Way, Erie, Cleveland, Ohio

Regaging of track may become necessary as the result of one or more of three causes:

1. Rail wear, generally on the sharper curves.
2. Canting outward of one or both rails.
3. Movement outward of the rail base or tie plate on the tie.

Where one rail of the track is in proper condition, it is usual to gage the other one to it. For one, or any combination of the causes mentioned, the spikes should be pulled, the old holes plugged and the spikes redriven in their original location. The reasons for this are:

1. The holes must be plugged; otherwise it is not practicable to spike to gage in either the old or the unused holes where there has been side wear on the rail head.

2. If one rail is moved in, the spikes must be replaced in their original location in order that the proper relation may be maintained relative to the spikes holding the opposite rail on the same tie. That is, the outside spikes must be opposite to prevent the ties from sluing.

When laying new rail, it is usual to spike in the unused holes, because the rail will then lay to correct gage. This statement may be qualified to the extent that if it is expected to relay rail more than once during the normal life of the ties, it may be advisable to reuse the old spike holes at the time of the first renewal, reserving the new holes for later rail renewals, not long before the tie is to be removed from the track. The judgment of the supervisory officer should govern in individual cases.

Where spikes are pulled and not redriven in the same holes, there is some question as to the advantage of plugging the old holes. Where the holes are bored clear through the tie and it is treated afterward, the plugging of the holes will not appreciably arrest decay. If it is desired later to spike in the old holes, they can be plugged at that time. Again, the judgment of the supervisory officer should govern in each case.

In this connection, it may be well to say that with our independently-fastened tie plates, or lagged construction, it is never necessary to regage, except for rail wear, and then only in exceptional cases.

Would Always Plug Used Holes

By C. W. BALDRIDGE
Assistant Engineer, Atchison, Topeka & Santa Fe, Chicago

Answering the questions in the order given, the answer to the first will depend on (1) the frequency with which the rail must be regaged or renewed; (2) the kinds of ties in use; and (3) the relative life of the ties and of the rail. In regaging, the spikes should be redriven in the old holes.

When renewing rail, assuming that the track is an old one in which the annual tie renewals have become approximately uniform, it would seem to be good practice to spike in the unused holes, provided the average service life of the rails exceeds one-half the average service life of the ties. This will allow advantage to be taken of the firmer part of the tie during the latter half of its service life, the spikes having been in firm wood during the first half of the tie life.

Where this practice is followed, the old spike holes should be well plugged to prevent moisture reaching the torn fibres, which result from the driving and pulling of the spikes, even in prebored holes.

Many Factors Influence Solution

By W. H. SPARKS
General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

These are questions that have rather wide ramifications, so that they cannot be answered categorically. Much depends on the condition of the ties, their average life, the treatment they have already received, the probable life of the rail, whether tie plates are in use, the reasons for gaging and other factors, some of which are local.

When regaging track, I believe that tie plugs should be inserted wherever spikes are pulled, whether the ties are treated or untreated. If the wheels are not covering the running surface of the rails, the adzing necessary to straighten the rail should be done at this time, regardless of the use or non-use of tie plates. The answer with respect to redriving the spikes must be qualified, since the proper action depends on several factors. If the tie is in the early stages of its service life, I would say that by all means one should return the spike to the old hole. However, where the tie is near the end of its service life, it may be necessary to drive in the unused hole to obtain satisfactory results. There is a period between these extremes when no general rule will apply and the matter must be decided in the light of the conditions as they exist.

To my mind, there should be one general rule, however, to the effect that the old holes shall be used and reused so long as the gage can be held. When this is no longer assured, the spike should then be driven into the unused hole. To conserve the ties, however, this rule should be applied under alert supervision. This practice reserves the unused hole for spiking new rail. It should be borne in mind also that when the spiking is changed at one end of the tie, it is necessary to change it at the other, so that it will be necessary to drive spikes in all four unused holes.

When renewing rail, I believe that all spikes should be pulled and all ties adzed to insure a proper bearing for the new rail. All used holes should be plugged, and the new rail should be carefully gaged. In many instances, this can be accomplished by respiking in the old holes. In others it will be necessary to spike in the unused ones, particularly in the older ties. This is a matter, however, that must be decided on the ground, with due regard for its effect on the remaining service life of the ties. Here again, the rule should be applied of reusing the old holes so long as it is practicable to do so.

Should Generally Be Redriven in Same Holes

By THOMAS WALKER
Roadmaster, Louisville & Nashville, Evansville, Ind.

As a general rule, spikes should be redriven in the holes from which they are withdrawn, rather than in the unused holes, since spiking is more or less injurious to the ties, even when driven in prebored holes. Cut spikes fray and distort the fibre of the wood, thus opening the way for the entrance of moisture, which tends to accelerate decay.

When new rail is laid on tangent, if the old rail is to proper gage, there should be little necessity for regaging and I see no reason why the spikes should not be driven into the old holes, neither do I think it is necessary to plug the holes in such cases. When laying rail of the same section as that released, the inside spike is usually pulled and it will usually return to a good snug fit in the same hole. If the hole has been enlarged for any reason, however, it is proper to plug it.

When relaying rail of the same section on sharp curves, or when regaging on sharp curves, which is necessary quite frequently, it sometimes occurs that a satisfactory job cannot be obtained by redriving the spike in the old hole. The reason for this is that frequently the spreading of the rails has enlarged or otherwise damaged the old hole to the extent that the holding power of the spike is too greatly reduced, even though the hole may be plugged. In this event, it seems proper to drive the spikes in the unused holes. I believe quite strongly that wherever a good job can be obtained by placing the spikes in the same holes, this should be done rather than to use the alternate holes. There can be no question but that if the spiking is done in the alternate holes, the old holes should be plugged, as this will, to some extent, arrest decay.

Would Reverse Only If It Cannot Be Avoided

By J. L. SOUTHARD
Assistant Cost Engineer, Chesapeake & Ohio, Columbus, Ohio

When track is regaged or new rail laid, plugs should be inserted in the old spike holes and the spikes redriven in the same holes. Tie plugs of uniform size and thorough treatment are necessary if additional damage to the tie is to be prevented. Under-sized or untreated tie plugs are worse than none. Some roads advocate a reversal of the spiking when it becomes necessary to remove the spikes from the ties. I think this is wrong, even if the holes are properly plugged, since it gives moisture a better opportunity to enter the tie and start decay. Where the tie plates are fastened independently with lag screws, reversing the spiking is out of the ques-

tion, since the spikes and screws will both come at the same corner of the plate. Our standard for double track places the outside spikes ahead, the inside spikes back and the lag screws just the reverse, thus securing the tie plate evenly and rigidly at four points.

There are several types of tie failures, including decay, spike killing, shattering, plate or rail cutting, breaking, burning and those damaged by derailments. Of these, decay, spike killing and shattering account for the most of our failures. Heavy preservative treatment and a careful selection of ties for the various classes of service have greatly reduced decay and shattering, but a large percentage of failures can still be attributed to improper spiking. The present preboring of ties requires four spike holes at each end of the tie. This does not mean, however, that spiking should be reversed at any time during the life of the tie. The great advantage is that it allows the preservative to enter the tie more readily at the point where it is most needed. There is no doubt that preboring greatly reduces the damage from spiking by reducing the crushing of the wood fibre, provided care is exercised to place the tie plate properly against the base of rail and squarely over the holes.

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Painting Hot Steel Surfaces

What effect, if any, do high atmospheric temperatures or high temperatures of the metal have on red lead or other paints when applied to steel structures?

Does Not Cause Excessive Oxidation

By FRANCIS M. HARTLEY, JR.
Sales Department, National Lead Company, New York

In considering this question it is well to bear in mind that red lead paints, as well as other paints, can be baked successfully at temperatures ranging from 120 to 200 deg. Even marking paints that are applied on hot rolled sheets at the mill give very long service. Black-bulb thermometers placed in the sun and shielded from the wind during the hottest weather last summer did not show a temperature higher than 140 deg.

On the other hand, steel structures probably do not reach a temperature higher than 115 deg. At this temperature the rate of oxidation of the linseed oil is not excessive and consequently there is no excessive hardening of the film. At this point it is well to remember, however, that heat facilitates the drying, or oxidation, of linseed oil and that moisture retards it. These two influences are, therefore, opposed in their action. For this reason, on hot, humid days in the summer the rate of drying may not be entirely satisfactory, because of the high moisture content of the air.

Another factor of importance is that heat causes linseed oil to expand and hence, to lose viscosity, with the result that the paint appears to be very thin. When paint in this condition is applied to a hot surface, it covers a large area, but the film is thin. In addition, a hot surface may cause trouble from running. This naturally affects the durability of the job. On the other hand, during the fall and winter when temperatures range from 35 to 50 deg. paint is more likely to be viscous and a thicker film will be applied to the surface. Also, since the air contains relatively less moisture during the winter than in the summer, a better drying condition for the linseed oil may be present despite the lower temperature.

Despite the effect of temperature on the viscosity of the oil, there is no reason why red-lead paint applied at 115 deg. should not give good service. The principal points to consider are whether the paint has been brought into intimate contact with the metal by being well brushed, and whether it can dry in the normal way. One advantage of painting in cool weather, which has not been mentioned, is that insects are less common and do not, therefore, get into the paint. When embedded in a paint film, their bodies decompose, leaving it porous.

Hot Surfaces Likely to Cause Chalking

By E. C. NEVILLE
Bridge and Building Master, Canadian National, Toronto, Ont.

It is the universal experience that when steel or iron surfaces are exposed to the atmosphere, corrosion sets in. It is only by coating the metal surface with material that will exclude air and moisture that rusting can be prevented. A good quality of red lead in oil, properly applied as a paint film, seems to be the best material for protecting against corrosion, but even this will not prove to be successful, unless certain factors are given consideration, such as cleanliness of the metal, temperature and proper workmanship in application.

Linseed oil, which is the usual and most satisfactory vehicle for the red-lead pigment, undergoes a marked chemical change when exposed to the air in the form of a paint film. As it absorbs oxygen, it becomes tough and dry, thus providing an excellent binder for the pigment, when applied under moderate temperature conditions. But when subject to high temperature, as when applied to metal exposed to the sun during the summer season, the heat thins the oil to such an extent that the oil content of the film is reduced and there is not sufficient binder for the pigment. This leaves the film "chalky" and reduces its imperviousness, thus reducing, if not destroying, its usefulness as a protection against the entrance of moisture. This is also true of other paints that are applied under like conditions.

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Killing Weeds

Where track mowers, ballast discers and weed burners are available, to what extent and in what way is it desirable to co-ordinate the use of these machines? If two or more are to be used, in what sequence should they be operated? Why?

Use of Equipment Should Be Co-ordinated

By C. R. KNOWLES
Superintendent Water Service, Illinois Central, Chicago

As a rule, the various methods of killing weeds are co-ordinated to a limited extent, generally being confined to the use of track mowers and burners. Where track mowers and weed burners are used on the same territory, it is desirable to operate the mower in advance, allowing a sufficient interval for the weeds to dry, so that they will burn readily and be completely consumed when the burner passes over them.

If discers are operated in conjunction with weed burners, the sequence should be reversed. In other words, the burners should pass over the track in advance of the discer. Operating in this sequence insures that all of the weeds will be destroyed before the discing begins and, therefore, that no green vegetation

will be turned under and mixed with the ballast by the discs or scarifier.

Mowers and discers are rarely used in conjunction with each other. When they are used jointly, however, there is little choice with respect to the sequence in which they should be operated. If there is a preference it probably would be for the mower to operate first, since there would be less likelihood of green vegetation becoming mixed with the ballast.

Cuts the Weeds First

By C. S. KIRKPATRICK

Chief Engineer, Gulf Coast Lines, Houston, Tex.

We run our track mowers first and, if the vegetation in the track and on the shoulder is heavy, the weed burners follow at a sufficient interval to insure that the weeds and grasses cut by the mower will be so dry that the burner will consume them. We then follow with discers, in tandem, completing the operation as we go.

We follow this sequence because we desire to burn the shoulder and top of the embankment as clean as possible. This can be accomplished more thoroughly by cutting the grass and weeds with mowers and permitting them to dry before burning. We run the burner behind the mower for the reason that we do not want the discer to mix the live weeds and grass in the ballast shoulder, where they tend to foul and block drainage. After these two operations have been completed, a clean shoulder is left for the discers and a good job is obtained.

We have found that, over a period of years, burning off the track has a tendency to kill vegetation permanently, particularly in the center of the track, and we do not have to burn as often as formerly. We try to reduce machine operations to as few as practicable. It is our plan to keep the track clean enough so that the section forces can work it wherever necessary without spending any time in cleaning the shoulder in preparation for jointing or surfacing. In this territory we usually run the weed mowers and burners about twice during the season and the discers three times.

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Misusing Claw Bars

In what ways are claw bars misused? How can the trouble be corrected? What is the proper way to use them?

Knows of No General Misuse

By E. D. SWIFT

Assistant Engineer, Chicago & Western Indiana, Chicago

I know of no practices in the use of claw bars that might properly be regarded as a misuse of this tool. There may be individual cases of misuse, but it is the function of supervision to correct them the same as with other tools. Furthermore, it is difficult to understand how a claw bar might be damaged in its application to any service coming within its scope and the bounds of ordinary trackwork, beyond what might be expected from normal use, for such use is most severe in its effect on the tool.

It is common practice to strike the claw bar with a spike maul to force the points of the claw under the head of spikes. The battering thus received is a prominent cause of deterioration and eventual retirement, but such treatment can hardly be regarded as misuse, since there are no other effective means available, at least within the writer's experience, for pulling spikes by hand.

Again, it appears probable that measures that might be less severe on the tool, would result in higher total labor costs.

In this discussion it has been assumed that the ordinary track spike is being used. A spike is now on the market in which the ears of the head are higher relative to the throat, thus facilitating the use of the claw bar. Experience with this spike indicates that little or no striking of the claw bar is necessary to engage the spike for pulling. A plan of a spike of this new type was presented as information to the A. R. E. A. at its last convention.

Driving With Maul Largely Unnecessary

By ROBERT WHITE

Section Foreman, Grand Trunk Western, Drayton Plains, Mich.

It is my observation that the most common misuse of the claw bar is that of driving it under the heads of spikes that are hard to pull. I am convinced that much of this hammering with the spike maul is unnecessary, particularly around frogs. If the proper tool, the spike puller, is used, there is no need of driving the claw bar with the maul. I know of several roads that prohibit the practice of hammering claw bars and yet they seem to get good results when pulling their spikes. Spikes that are hard to pull can often be pulled easily after they are tapped with the maul.

From the safety point of view, a claw bar should never be placed under a spike with the purpose of holding it upright and thus avoiding the necessity for stooping over to pick it up, for if left in this manner, the bar may fall and cause a personal injury. This also applies to nipping, for which work, by the way, a claw bar should never be used. If it is used for nipping the rail, however, it should not be allowed to remain between the rail and the tie, while other work is being done. A shim should be placed as soon as the rail is to the proper height, since if the bar should slip out, there is great danger that some one's finger will get caught.

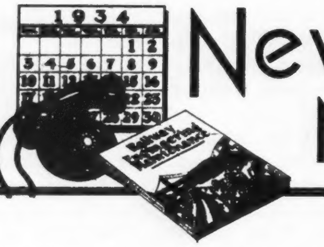
Misuse Greater Now Than Formerly

By W. H. SPARKS

General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

It can be said without fear of contradiction that the spike maul is the greatest enemy of the claw bar. Formerly, claw bars were not as badly misused as they are today, because spikes were not kept tapped down so consistently as now. Where rails had cut into the ties, it was our practice to adze around the spike, thus making it easy to set the jaws of the claw bar under the head. This was necessary because the older designs did not have a long foot and striking face, so that a blow with a maul was exceedingly hard on the hands.

Owing to the extensive use of tie plates and the practice of keeping the spikes settled to a snug fit, it is now more difficult to insert the claw bar under the head of the spike, and hammering with a maul is generally resorted to. I find, however, that the greatest abuse occurs where tie plates are not in use and the ties are badly rail cut. This can be overcome in large measure by adzing around the spikes. Doing this would, at the same time, reduce the probability of personal injury. It is not uncommon for the head of a spike to break off and strike a workman while he is driving a claw bar under it. If the maintenance forces were required to make ready before using claw bars, much of the damage that this tool now receives would be eliminated.



News of the Month . . .

Carloadings Resume Upward Trend

After holding steady for several weeks railway carloadings for the nation again pushed ahead in the week ending May 19 to a total of 611,142 cars, which was an increase of 9,403 cars over the preceding week, 75,423 cars over the same week last year and 95,514 cars over the corresponding week in 1932. Freight volume for the week ending May 19 was the heaviest in two months and the third largest this year. The increase over the previous week was due principally to an increase of 6,802 cars in ore loadings, although loadings of coal, miscellaneous freight and livestock also showed increases for the week.

Trackmen on L. & N. Have Seven-Year Perfect Safety Record

What is probably one of the most remarkable railroad safety records yet established is that held by William Holland, supervisor of track on the Louisville & Nashville at Butler, Ky., and the track employees under his jurisdiction. Nearly seven years have now passed since a reportable injury occurred among this group of employees, during which period they have worked more than two million man-hours. The group has not had even a minor injury since July 15, 1929. Each year the group holds a "safety" dinner at Butler to celebrate the continuity of its perfect safety record, at which addresses of appreciation are delivered by the superintendent of safety and other officers.

B. & O. to Operate Streamline Steam Train

The first high-speed light-weight streamline train to be drawn by steam power is to be placed in operation soon by the Baltimore & Ohio which has obtained a loan of $900,000 from the Public Works Administration to enable it to develop such a train and also to purchase a similar train to be drawn by a Diesel-electric engine, both trains to be placed in operation between New York and Washington, D. C. Both trains will be capable of speeds of 90 to 100 miles an hour, although it is not anticipated that it will be necessary to operate this fast on regular schedules. The steam locomotive is a 4-4-4 type Class J-1 locomotive which will be converted for streamline operation by the Baltimore & Ohio in its own shops. The proceeds of the loan will be used to purchase an 1,800-hp. Diesel-electric engine and a total of 16 streamline, light weight coaches for both trains, the manufacture of which is estimated to create 600,000 man-hours of employment. Each train will consist of six cars and the locomotive, four cars being held in reserve.

This is the second P. W. A. allotment for high-speed trains, the first being $400,000 to the New York, New Haven & Hartford for an articulated train to operate between Boston and Providence.

March Income of Railroads Shows Increase Over Last Year

The Class I railroads of this country had a net railway operating income for March of $52,047,881, which was at the annual rate of return of 2.59 per cent on their property investment, as compared with a net of $10,815,304, or 0.53 per cent, in March, 1933. Operating revenues for March amounted to $293,177,640, compared with $218,102,308 in March, 1933, an increase of 34.4 per cent, while operating expenses totaled $209,251,017, as against $175,724,395, an increase of 19.1 per cent.

For the first three months of this year the net railway operating income of these roads amounted to $112,276,896, or 2.23 per cent, as compared with $34,551,646, or 0.68 per cent a year ago.

Travels 1015 Miles in 785 Min.

Breaking all records for average train speeds for distances of 200 miles and over, the "Zephyr," new stream-lined, Diesel-powered train of the Chicago, Burlington & Quincy, completed the longest non-stop run ever made by a railroad train, when it covered 1015.4 miles from Denver, Colo., to Chicago, between 5:05 a. m. (mountain time) and 7:10 p. m. (central time) on May 26, or at an average speed of 77.5 miles for the entire distance. Specific speed records in the course of the trip included a maximum attained speed of 112.5 m.p.h., 6.4 miles at an average speed of 109.0 m.p.h., 19.1 miles at an average speed of 106.2 m.p.h., and 129.5 miles at an average speed of 90 m.p.h.

This record run was made after the most detailed preparations to insure safety. The engineering department checked the profile over the entire line to insure accurate data on grades, all curves were checked for superelevation and markers were placed along the line at all points where speed restrictions were necessary. All switches were spiked, and in addition three maintenance officers under the direction of H. R. Clarke, engineer maintenance of way, rode in the cab all the way to advise the operators of the train of roadway conditions.

Even more elaborate were the arrangements made to prevent grade crossing accidents and to safeguard the lives of some half million people who gathered in crowds all along the right of way to witness the record run. As a result of personal visits of general and division superintendents, the mayors and police officers of the cities and villages along the line co-operated in an effective organization for the policing of the entire right of way. Superintendents, roadmasters, master carpenters and others made motor car trips over the line to instruct the railway men and volunteer guards in methods of controlling the crowds. Two flagmen were stationed at every public crossing and one at every private crossing. As a result, no accident of any kind occurred during this memorable trip.

Southern Gets Permission to Continue 1½-Cent Fare

Continuation throughout the remainder of this year of the experimental reduced passenger fares established by the Southern and affiliated lines on December 1, 1933, including coach fares of approximately 1.5 cents a mile and fares in sleeping and parlor cars ranging from 2 to 3 cents a mile, was sanctioned by the Interstate Commerce Commission on May 5 when it granted a waiver of certain of its tariff rules and special permission to publish tariffs on one day's notice. This decision was made in spite of objections made by the N. R. A., the National Association of Motor Bus operators, and other railroads in southern territory that desired to experiment further with coach fares of 2 cents a mile and had entered into a tentative agreement with the bus operators on that basis. The opinion was expressed by representatives of the railroads that the granting of the Southern's application would force the adoption of the 1.5 cent rate generally throughout the South, thus putting into effect three general bases of fares throughout the country, one in the South, another in the East, and a third in the West.

Transport Exhibits of World's Fair Include New Features

A Century of Progress Exposition for 1934 opened its gates at Chicago on Saturday, May 26, with many new and revised features for the entertainment and instruction of the public. The exhibits and displays forming the travel and transport section of the exposition again comprise one of the major attractions of the fair and include exhibits of railroads and railroad supply companies, of automobile industries, of air transportation companies and of motor transportation enterprises. So rapid have new developments taken place in the transport field that many of the features on display at the fair this year could not have been shown last year because at that time they were still in the future. Two examples of these new developments are the high-speed, streamlined, articulated, light-weight passenger trains which are being exhibited this year by the Union Pacific and the Chicago, Burlington & Quincy.

As last year, the exhibits housing the travel and transport section of the fair are located in the Travel and Transport building and on tracks adjacent to the building. The exhibits include railroad cars and lo-

comotives, airplanes, products of manufacturers, motion pictures, paintings, animated models and dioramas, miniature railway systems in operation and displays of the most modern developments of transportation, contrasted with historical displays. Many vehicles of transportation appear in a pageant of the progress of transportation known as the "Wings of a Century," which is presented daily in an outdoor theatre located on the lake adjacent to the Travel and Transport building. This feature also includes scenes and episodes that were not shown last year.

Supreme Court Upholds Water-Competitive Rail Rates

Railroads are acting entirely within their rights in reducing rates on certain commodities between certain points in order to meet the competition of water lines, according to a recent decision of the Supreme Court of the United States. This decision affirmed the decree of a lower court which had refused the application of the Mississippi Valley Barge Line Company for an injunction setting aside an order of the Interstate Commerce Commission authorizing the Illinois Central and other railroads to put into effect reduced rates on sugar from Louisiana to Cincinnati, Ohio, and St. Louis, Mo., to meet the competition of water lines which had obtained most of the traffic. The barge line had contended that the commission had been heedless of the mandate of Section 500 of the Transportation act which declares it to be the policy of Congress to promote, encourage and develop water transportation. In its decision the Supreme Court said that this "admonition does not mean that carriers by rail shall be required to maintain a rate that is too high for fear that through the change they may cut into the profits of carriers by water."

Trucking Industry Organizes Under N. R. A. Code

Under the provisions of its N. R. A. code the motor trucking industry is building up an elaborate organization of national, regional, state and division code authorities, more or less affiliated with national and state associations, which are not only to function in administering the code and in connection with efforts to stabilize rates and employment conditions within the industry, but apparently are planning to become active in controversies with the railroads before the Interstate Commerce Commission. The latter thought appears to be verified by a bulletin recently issued to the members of the American Trucking Associations, Inc., announcing that the National Code Authority for the industry desired all for-hire operators in official territory to file immediately with their respective state code authorities their minima for rates and tariffs, stating that this was deemed necessary by a report proposed to the I. C. C. recommending that railroads in official territory be granted fourth-section relief in establishing truck-competitive rates. The bulletin stated that "the trucking industry will resist as vigorously as it can adoption of this report by the commission."

Association News

Metropolitan Track Supervisors' Club

The annual meeting will be held on the afternoon of June 9 following a luncheon at Keen's Chop House, 72 West Thirty-Sixth street, New York City. Aside from the annual election of officers, this meeting will be largely social in character.

The Wood Preservers Association

President S. R. Church has called a meeting of the executive committee at Buffalo, N. Y., on June 14 to consider the completion of the committee organization, to consider the report of a special committee on the co-ordination of the Association's specifications and to transact other business.

The Bridge and Building Association

The Western Association of Railway Executives, which asked this association, in common with other associations, to suspend its activities in 1931, has advised the Bridge and Building Association that it will waive objection to the holding of a convention this year. An early meeting of the executive committee is contemplated to consider the changed conditions brought about by this action of the executives and to formulate plans for a convention.

The Roadmasters Association

Arrangements are being made for a meeting of the executive committee at Chicago on June 16, at which definite plans will be formulated for a convention next September, in accordance with authorization received from the Western Association of Railway Executives approving the holding of a convention this year. The last convention of this association was held in 1930. Committees appointed some months ago are now working actively on their reports, all of which will be ready for presentation at the convention.

American Railway Engineering Association

Montreal was the center of activity of the association on May 21 and 22. The Committee on Standardization held a joint meeting with the Canadian Engineering Standards Association, attended by 50 persons on May 21, while 16 officers and directors attended a meeting of the Board of Direction of the association, and 29 members attended a meeting of the Committee on Track on May 22. Meetings were held also by six other committees of the association during the month. Meetings were held in Chicago by the Committee on Maintenance of Way Work equipment on May 1; the Committee on Waterways and Harbors on May 8; the Committee on Iron and Steel Structures on May 10 and 11, with an attendance of 18; the Committee on Ballast on May 23; and the Committee on Masonry on May 23 and 24, with an attendance of 26. New York was the place of meeting of the Committee on Rail on May 3, and the Committee on Records and Accounts on May 23, while the Committee on Buildings held a meeting in Cleveland on May 15 and 16.

Railway Tie Association

This association held its annual convention at Cleveland, Ohio, on May 16-17 with approximately 100 producers of cross-ties and railway purchasing officers in attendance. The association was addressed by John V. Neubert, chief engineer maintenance, New York Central System, who spoke on the Crosstie of Today, and by R. L. Lockwood, director of the Section of Purchases on the staff of the federal co-ordinator of railways, who reviewed the work which his section is doing in co-ordinating purchasing practices on various railways. Other than these papers, the meeting was devoted largely to the consideration of problems imposed by the crosstie code of the N. R. A.

Eastman to Be Co-ordinator for Another Year

President Roosevelt on May 2 issued a proclamation extending for another year from June 16 the life of Title I of the Emergency Transportation Act, 1933, which provides for the position of federal co-ordinator of transportation, held by Joseph B. Eastman. The law provided that this part of the act should cease to have effect at the end of one year after its effective date unless extended by a proclamation of the President for one year or any part thereof.

Eastman Favors Investigation of New Waterway Projects

The necessity for such an analysis of the merits of new waterway projects as will ensure consideration of only those that are economically justified, taking all pertinent facts into consideration, was emphasized by Joseph B. Eastman, federal co-ordinator of transportation, in a recent address before the National Rivers and Harbors Congress at Washington. In view of the surplus in transportation facilities which now exists, he said, it is clear that we should be slow to add still more. In outlining the proposal included in his recent report for regulation of water carriers by the Interstate Commerce Commission, he said he was not suggesting that the commission should have control over the construction of new waterways, but that Congress should in some way provide for a very careful investigation of the economic soundness of a new project before it is undertaken.

In discussing competition between the railroads and the waterways, Co-ordinator Eastman stated that "the essential thing is to find, as near as may be, the place which each of the forms of transportation should occupy in the national transportation system, and give it opportunity to function freely in that place without uneconomic duplication or destructive competition from other forms of transport."

Personal Mention

General

Carl Bucholtz, vice-president and general manager of the Virginian, who has had many years experience in the engineering and maintenance of way departments of a number of railroads, has been elected president, with headquarters as before at Norfolk, Va. Mr. Bucholtz was born on March 21, 1883, at Baltimore, Md. He was educated at Loyola college and entered railway service with the Baltimore & Ohio in June, 1902, as a special machinist apprentice. From June, 1904, to March, 1906, he was a maintenance of way inspector for the same road and on the latter date he was appointed assistant engineer of the Baltimore division. In August, 1907, Mr. Bucholtz was promoted to assistant division engineer of the Cumberland division at Cumberland, Md. He was supervisor of track of the Mountain district of the same road from February to December, 1908, then becoming maintenance of way inspector on the Missouri Pacific at Little Rock, Ark. He remained in this position until June, 1910, when he was promoted to division engineer of the Joplin division at Nevada, Mo. In November, 1914, Mr. Bucholtz entered the service of the Erie as an assistant engineer at Cleveland, Ohio, also serving on special duties assigned to him by the assistant general manager. In January, 1915, he became division engineer of the Meadville division of the Erie and from May to October of the following year he was trainmaster on the Marion division at Huntington, Ind. He became assistant superintendent of the Mahoning division on the latter date and in November, 1917, he was appointed superintendent of the same division. He was assistant general manager of the Western district from February to November, 1927, at which time he was appointed general manager of that district. Mr. Bucholtz resigned as general manager of the Erie in March, 1932, and in April, 1933, entered the service of the Virginian as general manager, with headquarters in Norfolk, Va. He became vice-president and general manager of that road in August, 1933, serving in that capacity until his recent election to the presidency.

Engineering

D. A. Ruhl, formerly an assistant engineer on the Chicago Terminal division of the Chicago, Rock Island & Pacific, has been reappointed to that position, with headquarters at Chicago.

C. B. Bronson, assistant inspecting engineer, rails, steel wheels and structural steel, New York Central Lines, has been appointed inspecting engineer in charge of rails and structural steel, with headquarters at New York, succeeding **Arthur Knapp**, whose death is noted elsewhere in these columns. All matters pertaining to steel wheels and other mechanical matters, formerly handled by Mr. Knapp, have been transferred to the jurisdiction of **F. H. Hardin**, assistant to the president, mechanical matters.

J. A. Schwab, supervisor on the Maryland division of the Pennsylvania, with headquarters at Wilmington, Del., has been promoted to assistant division engineer on the Middle division.

H. R. Clarke, engineer maintenance of way of the Chicago, Burlington & Quincy, with headquarters at Chicago, has had his jurisdiction extended over the Colorado & Southern, the Ft. Worth & Denver City and the Wichita Valley, all of which are controlled by the Burlington.

J. E. Teal, special engineer on the staff of the vice-president of the Chesapeake & Ohio, with headquarters at Richmond, Va., has been promoted to transportation engineer, reporting to the general manager, with the same headquarters. Mr. Teal was born at Arcadia, Ind., and received his higher education at Purdue University, from which he obtained the degree of B. S. in 1909 and C. E. in 1914. Prior to his college education, Mr. Teal had considerable railway engineering experience, having served with the Baltimore & Ohio in various capacities in the engineering department from May, 1905, until June, 1909. At the end of this period he became connected with the Missouri Pacific as assistant engineer in the maintenance of way department, handling survey and building construction work, and later became a roadmaster and then an assistant division engineer. In September, 1911, he returned to the B. & O. as assistant engineer on the general manager's staff, and later was appointed to the vice-president's staff as chief of the utilization of equipment bureau, directing the efforts of the road to secure greater efficiency in eliminating car delays and increasing car loads. During federal control of the railroads, he served as special engineer on the federal manager's staff, handling a wide range of work having to do with maintenance of way, construction and operating problems. At the end of federal control, Mr. Teal transferred to the vice-president's staff as special engineer, which position he held until August 1, 1923. On this date, Mr. Teal left the B. & O. to become a special engineer on the staff of the vice-president (operation) of the Chesapeake & Ohio. In this position, which he has held until his recent promotion to transportation engineer, Mr. Teal has handled many problems, largely economic, which were given consideration for the purpose of developing increased operating efficiency.

Track

William Ditty has been appointed acting supervisor of track on the Wabash, with headquarters at Decatur, Ill., succeeding **John Ormond**, deceased.

M. S. Smith, assistant supervisor on the Middle division of the Pennsylvania, has been promoted to supervisor on the Monongahela division, with headquarters at West Brownsville Junction, Pa., to succeed **G. M. Hain**, who has been transferred to the Middle division, with headquarters at Lewiston, Pa. **J. P. Newell**, supervisor on the Middle division, has been transferred to the Maryland division, with headquarters at Wilmington, Del., to succeed **J. A. Schwab**, whose promotion to assistant division engineer, is noted elsewhere in these columns. **C. W. Heinze**, supervisor at Sharpsburg, Pa., has been transferred to the Atlantic division, with headquarters at Camden, N. J., to succeed **P. W. Triplett**, who has been transferred to the Chicago Terminal division. **J. C. Warren** has been appointed assistant supervisor on the Philadelphia division, with headquarters at Harrisburg, Pa. **P. D. Fox**, assistant supervisor, Philadelphia division, has been transferred to the Middle division, with headquarters at Tyrone, Pa.

H. Zimmerman, a yard foreman on the Chicago, Milwaukee, St. Paul & Pacific at Milwaukee, Wis., has been appointed acting roadmaster on the Madison division at Janesville, Wis., to replace **C. A. Drawheim**, who has been placed in charge of a system tie gang.

F. Kirk, roadmaster on the El Paso-Amarillo division of the Chicago, Rock Island & Pacific, with headquarters at Dalhart, Tex., has been transferred to the Arkansas-Lousiana division at El Dorado, Ark., succeeding **M. B. McAdams**, who has been transferred to Dalhart.

The Rock Island has placed the track inspector system of track supervision in effect on its Chicago Terminal division, and **C. A. Barr**, formerly a roadmaster, and **John Nolfe** have been appointed track inspectors on this division with headquarters at Chicago and Blue Island, Ill., respectively.

L. L. Smith, a yard foreman on the Chicago, Burlington & Quincy, at St. Joseph, Mo., and formerly a roadmaster on this road, has been appointed roadmaster on the Ottumwa division, with headquarters at Burlington, Iowa, succeeding **A. C. Anderson**, who has been transferred to Albia, Iowa, succeeding **M. M. Shehan**, who has retired after 50 years service with the Burlington. **B. L. Kapple**, a supervisor of track, has been appointed to the newly-created position of assistant roadmaster on the Creston division at Creston, Iowa.

Mr. Shehan was born on February 6, 1867, at Georgetown, Iowa, and first entered the service of the Burlington on July 11, 1884, as a section laborer at Tyrone, Iowa. On June 6, 1889, he was promoted to track foreman with headquarters at Albia, Iowa, and on April 1, 1893, he was further advanced to extra gang foreman on the Ottumwa division. On September 11, 1900, Mr. Shehan was appointed yard foreman at Burlington, Iowa, being made acting roadmaster with the same headquarters three years later. On October 1, 1903, he resumed the position of yard foreman at Burlington and on August 1, 1905, he was promoted to roadmaster on the Burlington division (now the Ottumwa division), which position he held continuously until his retirement.

Bridge and Building

L. H. Hornsby has been appointed assistant engineer of bridges on the Seaboard Air Line, with headquarters at Norfolk, Va., succeeding **J. B. McClain,** whose death was noted in the May issue.

Obituary

W. V. Lattin, bridge and building supervisor on the New York, New Haven & Hartford, with headquarters at Hartford, Conn., died on May 21 of heart trouble.

W. L. Foster, professor of railway engineering, Iowa State College, Ames, Iowa, was killed in an automobile accident in DeKalb county, Illinois, on May 23, while enroute to Chicago to attend a meeting of the Committee on Ballast of the American Railway Engineering Association.

W. C. Waggener, who retired on September 1, 1930, as supervisor of bridges and buildings on the Illinois Central with headquarters at Princeton, Ky., died on May 13. At the time of his retirement Mr. Waggener had been connected with the Illinois Central for 42 years. He was born on August 12, 1860, in Hardin County, Ky., and entered the service of the Illinois Central on May 31, 1888, in the road department. After holding various positions in this department and the bridge and building department, he was promoted to supervisor of bridges and buildings on February 1, 1899.

Mack Clements, who retired on January 1, 1929, as supervisor of water stations of the Louisville & Nashville, died on March 9 at Pascagoula, Miss. Mr. Clements was born on November 2, 1849, and entered railway service at the age of 19 years on the grading and construction of the New Orleans & Mobile (now part of the L. & N.). During the next decade he worked as a checker of wood supplies for locomotive fuel, as a pumper and in a bridge gang. He was then made assistant in charge of water stations and in 1888 he was placed in charge of water stations, being given the title of supervisor of water stations in 1916.

Arthur Knapp, inspecting engineer of rails, steel wheels and structural steel for the New York Central Lines, with headquarters at New York, died suddenly in that city on May 3 as the result of a fall. Mr. Knapp, who was born on July 16, 1883, at Poughkeepsie, N. Y., had been in the service of the New York Central since 1900. In 1907, he first became connected with the engineering department in a clerical capacity, and in 1909 was appointed secretary to the consulting engineer of the road, the late Dr. P. H. Dudley, who was a recognized authority on rails and steel metallurgical subjects. In 1912 he was appointed assistant to the consulting engineer, and in 1924, upon the death of Dr. Dudley, he took over a large part of the Doctor's work with the title of inspecting engineer, rails, steel wheels and structural steel.

Supply Trade News

General

The Rails Company has moved its office from 405 Lexington avenue to 50 Church street, New York.

The Electric Railweld Sales Corporation, Chicago, has changed its name to **Teleweld, Inc.,** the change affecting only the name and not the personnel, management or policies.

The National Spray Painting and Finishing Association has selected the following to serve as members of the code authority of the spray painting and finishing equipment industry: **H. W. Beach,** president of the Eclipse Airbrush Company, Newark, N. J.; **W. B. Thompson,** president of Spraco, Inc., Somerville, Mass.; **W. F. Gradolph,** sales manager of the DeVilbiss Company, Toledo, Ohio; **J. F. Roche,** executive vice-president of the Binks Manufacturing Company, Chicago; **J. A. Paasche,** president of the Paasche Airbrush Company, Chicago; and **S. Deutsch,** president of the Electric Sprayit Company, South Bend, Ind.

Personal

R. B. Mildon, who has been elected vice-president of the **Westinghouse Electric and Manufacturing Company,** with headquarters at South Philadelphia, Pa., will have charge of the operations of marketing, engineering, manufacturing and service in connection with the products of the South Philadelphia works. Mr. Mildon was graduated from the civil engineering school of Cornell University in 1900, and shortly thereafter was employed by the Union Pacific and the Colorado Fuel & Iron Company in an engineering capacity. In 1906, he was appointed chief engineer of the Duquesne Mining Company, and three years later became associated with the Westinghouse company in charge of the gas producer department of its machine works at East Pittsburgh, Pa. In 1912, he was transferred to the Westinghouse Air Spring Company and in 1916, re-entered the employ of the Westinghouse Electric and Manufacturing Company as assistant to vice-president; recently he has been in charge of the stoker department.

R. B. Mildon

E. W. Backus, western representative of **Standard Equipments, Inc.,** New York, with headquarters at Chicago, has been appointed chief engineer in addition to his present duties, with the same headquarters.

J. G. Wallace, representative of the railway sales division of **The Texas Company** (California), Hearst building, San Francisco, Cal., has been appointed assistant district manager.

George P. Nichols, who retired in 1926 from active participation in the firm of George P. Nichols & Brother, Chicago, manufacturers of electric transfer tables, and turntable trucks and tractors, died at Milwaukee, Wis., on May 1. Mr. Nichols was born in Grafton, Mass., on March 29, 1862, and graduated from Worcester (Mass.) Polytechnic institute in 1883. In the same year he entered the employ of the Rhode Island Locomotive Works as construction engineer, which position he held until 1884, when he entered the employ of Brown & Sharp, Providence, R. I. In the same year he became construction engineer for the Thomson Houston Electric Company and when this company was merged with the General Electric Company in 1890, he was placed in charge of the power department, which position he held until 1894. In the latter year, he and his brother, Samuel F. Nichols, organized the firm of George P. Nichols & Brother, with which he was connected until his retirement in 1926.

George P. Nichols

William Ellis Corey, who was president of the United States Steel Corporation from August, 1903, to January, 1911, died on May 11 at his home in New York at the age of 68 years.

A. F. King, formerly with the Buffalo, N. Y., and Philadelphia, Pa., district sales offices of the **Reading Iron Company,** has been transferred to Boston, Mass., succeeding **John G. Ross,** who has resigned.

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